



# GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3720729

Semester – II

Subject Name: WIND & SOLAR POWER SYSTEM

Type of course:

Prerequisite:

Rationale:

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	2	4	70	30	30	20	50

Content:

Sr. No.	Content	Total Hrs
1	<ul style="list-style-type: none"><li>Historical development and current status</li><li>characteristics of wind power generation</li><li>network integration issues</li></ul>	8
2	<ul style="list-style-type: none"><li>Generators and power electronics for wind turbines,</li><li>power quality standards for wind turbines,</li><li>Technical regulations for interconnections of wind farm with power systems.</li></ul>	8
3	<ul style="list-style-type: none"><li>Isolated wind systems,</li><li>reactive power and voltage control,</li><li>Economic aspects.</li></ul>	6
4	<ul style="list-style-type: none"><li>Impacts on power system dynamics,</li><li>power system interconnection</li></ul>	8
5	<ul style="list-style-type: none"><li>Introduction of solar systems,</li><li>Merits and demerits, concentrators, various applications.</li></ul>	8
6	<ul style="list-style-type: none"><li>Solar thermal power generation,</li><li>PV power generation,</li><li>Energy Storage device.</li><li>Designing the solar system for small installations.</li></ul>	6

Reference Books:

1. Thomas Ackermann, Editor, "Wind power in Power Systems", John Willy and sons ltd.2005.



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2. Siegfried Heier, “Grid integration of wind energy conversion systems”, John Willy and sons ltd.,2006.
3. K. Sukhatme and S.P. Sukhatme, “Solar Energy”. Tata MacGraw Hill, Second Edition, 1996
4. RanjanRakesh, Kothari D.P, Singal K.C, “Renewable Energy Sources and Emerging Technologies”, 2nd Ed. Prentice Hall of India, 2011.
5. Math H.Bollen, Fainan Hassan, “Integration of Distributed Generation in the Power System”, July 2011, Wiley –IEEE Press
6. Loi Lei Lai, Tze Fun Chan, “Distributed Generation: Induction and Permanent Magnet Generators”, October 2007, Wiley-IEEE Press.
7. Roger A.Messenger, Jerry Ventre, “Photovoltaic System Engineering”, 3rd Ed, 2010
8. James F.Manwell, Jon G.McGowan, Anthony L Rogers, “Wind energy explained: Theory Design and Application”, John Wiley and Sons 2nd Ed, 2010

### Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	To get exposure to wind and solar systems	20
CO-2	To understand the factors involved in installation and commissioning of a Solar plant.	20
CO-3	To understand the factors involved in installation and commissioning of a Wind plant.	25
CO-4	Learning the dynamics involved when interconnected with power system grid.	20

### List of Experiments:

1. Study various wind generators and their comparison.
  2. Modelling of Solar PV sub-systems
  3. Modelling of wind generation sub-systems
  4. Simulation of power electronics converter/inverter used for grid integration of wind and solar system.
  5. Study reactive power and voltage control strategies for wind generation.
  6. Study the solar thermal generation.
  7. Study impact of solar and wind generation on power system.
  8. Study interconnection issues.
  9. Study power quality issues.
  10. Study technical regulations for interconnections of wind farm with power systems.
- **It is suggested to arrange field visit of nearby renewable energy generation plant for the students and submit the report of the visit.**



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- in this course, **The students may visit or prepare case study for installation of solar power plant for a given rating.**

## **Major Equipment:**

- ✓ Simulation software like MATLAB along with necessary toolbox, PSIM or Scilab
- ✓ The working model of solar/wind energy sources with necessary equipment used for measurement and analysis

## **List of Open Source Software/learning website:**

1. Courses available through NPTEL.  
- website : [nptel.ac.in](http://nptel.ac.in)