



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

WIND AND SOLAR ENERGY SYSTEMS								
PE-IV								
Course Code	Category	Hours /Week			Credits	MaximumMarks		
AEEC43	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
ContactClasses:45	TutorialClasses:Nil	PracticalClasses: NIL			TotalClasses: 45			
Prerequisite: Electrical Power Generating Systems								
I. COURSE OVERVIEW								
<p>This course is intended to generation of electrical power using renewable energy sources like wind and solar. It describes power conditioning schemes for solar energy system, maximum power point tracking algorithms, wind energy conversion systems and power quality issues in the integration of renewable energy resources to grid.</p>								
II. COURSE OBJECTIVES:								
The students will try to learn:								
<ol style="list-style-type: none"> I. The environmental aspects of renewable energy sources II. The availability of renewable energy sources for sustainable conversion of energy III. The impart knowledge on energy conversion systems in solar, wind and facilitate developing systems for different applications IV. The present energy scenario and need for energy conversion V. The power quality issues in integration of renewable energy resources 								
III. COURSE SYLLABUS:								
MODULE-I: DESIGN AND OPERATION OF WIND POWER SYSTEM(09)								
Wind Power System: Components, turbine rating, electrical load matching, variable-speed operation, system design features, maximum power operation, system control requirements, speed control, rate control and environmental aspects, wind energy conversion systems and their classification.								
MODULE-II: DESIGN AND OPERATION OF PV SYSTEM (09)								
Solar Photovoltaic Power System: The PV Cell, module and array, equivalent electrical circuit, open circuit voltage and short circuit current, I-V and P-V curves, array design, peak power point operation, PV system components; Solar Thermal System: Energy collection, synchronous generator, equivalent electrical circuit, excitation methods, electrical power output, transient stability limit, commercial power plants.								
MODULE-III: POWER CONDITIONING SCHEMES FOR SOLAR ENERGY SYSTEMS(09)								
Switching devices for solar energy conversion: DC power conditioning converters, maximum power point tracking algorithms.								
AC Power conditioners, Line commutated inverters, synchronized operation with grid supply, Harmonic reduction.								
MODULE-IV: WIND ENERGY CONVERSION SYSTEMS(09)								
Wind energy Conversion system (WECS): Performance of Induction generators for WECS, Self-excited induction generator (SEIG) for isolated power generators. Controllable DC power from SEIGs, system performance, Grid related problems, generator control, AC voltage controllers, Harmonic reduction and Power factor improvement.								
MODULE-V: POWER QUALITY ISSUES IN INTEGRATION OF RENEWABLE ENERGY RESOURCES (09)								
Stand alone and Grid connected systems, Power Quality issues, Impact of power quality problems on DG, Mitigation of power quality problems, and Role of custom power devices in Distributed Generation.								

IV. TEXT BOOKS:

1. Mukund R Patel, "Wind and Solar Power Systems", CRC Press, 1stEdition, 1999.
2. Publications, 2nd Edition, 2001. G D Rai, "Non- Conventional Energy Resources", Khanna Publishers, 1st Edition, 2002.

V. REFERENCEBOOKS:

1. Daniel, Hunt. V Wind Power, A Hand Book of WECS, Van Nostrend Co., Newyork, 2nd Edition, 1998.
2. ArindamGhosh, Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices", Springer, 1st Edition, 2002.
3. Roger C Dugan, Mark E Mc. Granaghan, Surya Santosoh and H. Wayne Beaty, "Electrical Power Systems Quality", TATA McGraw Hill, 2nd Edition, 2010.

III. WEB REFERENCES

1. <https://www.electrical4u.com>
2. <https://www.iare.ac.in>
3. <https://www.researchgate.net>
4. <https://www.cusp.umn.edu>

IV. E-TEXT BOOKS:

1. <https://www.jntubook.com/>
2. <https://www.freeengineeringbooks.com>