COURSE TITLE	**POWER ELECTRONIC CONVERTERS FOR RES**
COURSE CODE	**01EE1707**
COURSE CREDITS	**3**

Objective:

1 To study different power electronic converters for interface of renewable energy systems

Course Outcomes: After completion of this course, student will be able to:

1 Investigate the function and constraints of power electronic converters as applied to renewable energy system interfaces.

2 Select power electronic converter based on the type of renewable energy system

3 Differentiate among different power electronic converter topologies used in RES

4 Assess the performance power electronic converter used in RES

Pre-requisite of course: Power Electronics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Photovoltaic Inverter Structures – Single Phase Topologies** Introduction to Photovoltaic(PV) Inverter Structures, Inverter Structures Derived from H-Bridge Topology – Basic Full Bridge Inverter, H5 Inverter, HERIC Inverter, REFU Inverter, Full-Bridge Inverter with DC Bypass – FB-DCBP, Full-Bridge Zero Voltage Rectifier – FB-ZVR	8
2	**Photovoltaic Inverter Structures – Three Phase Topologies** Three phase two level inverter, The Neutral Point Clamped(NPC) Converter, CHB Converter, Pulse Width Modulation Strategies of Inverters, DC-Link Capacitor Current and Sizing in NPC and CHB Inverters, Loss Comparison of Two- and Three-Level Inverter Topologies	12
3	**PV Energy Conversion Systems** Power curves and Maximum Power Point of PV systems, Grid Connected PV system configuration, Control of Grid Connected PV systems, Anti-islanding detection	6

DR. AMIT DILIPKUMAR VED
Digitally signed by (Name of HOD)

DR. RAJENDRASINH BAHADURSINH JADEJA
Digitally signed by (Name of Dean/ Principal)

Contents : Unit	Topics	Contact Hours
4	**Grid Converter Structure for Wind Turbine Systems** Wind Turbine System power configurations, Standalone operation of fixed and variable speed wind energy conversion systems , grid integrated PMSG and SCIG Based WECS, Grid integrated solar system, grid power converter topologies – single cell VSC or CSC, Multilevel Converters, Wind turbine system control – rotor side control, grid side control, Controls and Grid Requirements for Modern Wind Turbines - Active Power Control, Reactive Power Control, Total Harmonic Distortion	16
Total Hours		**42**

Textbook :

1 Power Electronics for Renewable Energy Systems, Transportation and Industrial Applications, Haitham Abu-Rub, Kamal Al-Haddad, Mariusz Malinowski, John Wiley and Sons Ltd, 2014

2 Grid Converters for Photovoltaic and Wind Power Systems, Remus Teodorescu, Marco Liserre, Pedro Rodriguez, John Wiley and Sons Ltd, 2011

3 Power Electronic Converters for Microgrids, Sharkh SM, Abu-Sara MA, Orfanoudakis GI, Hussain B, John Wiley and Sons Ltd, 2014

References:

1 Power Electronics and control for maximum Energy Harvesting in Photovoltaic Systems, Power Electronics and control for maximum Energy Harvesting in Photovoltaic Systems, Nicola Femia, Giovanni Petrone, Giovanni Spagnuolo, Massimo Vitelli, CRC Press, 2013

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs, etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the classroom

3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, and Virtual Laboratory

DR. AMIT DILIPKUMAR VED
Digitally signed by (Name of HOD)

DR. RAJENDRASINH BAHADURSINH JADEJA
Digitally signed by (Name of Dean/ Principal)

Supplementary Resources:

1. https://cusp.umn.edu/
2. https://www.nrel.gov/research/re-photovoltaics.html
3. https://www.nrel.gov/research/re-wind.html
4. https://ocw.tudelft.nl/course-readings/1-2-2-lecture-notes-power-electronics-for-integration-of-renewables/