

## B.Tech III Year II Semester

**JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA**  
**19AEE64c- APPLICATIONS OF POWER ELECTRONICS TO RENEWABLE ENERGY SOURCES**

## (Professional Elective-II)

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**Course Objectives:**

- To introduce certain areas for applications of Power Electronics in Renewable energy sources
- To understand about Power Quality issues and converters to be used in Renewable energy sources
- To introduce the concept of AC link Universal power converters
- To introduce high power electronic applications to Wind turbines
- To introduce the concept of electric air craft

**UNIT – I: Basic Power Electronic Applications** **10 Hrs**

Introduction, Impact of power electronics in energy systems, challenges in power electronics to renewable energy systems, power electronics in energy, solar energy utilization, power electronics in wind energy utilization, power electronics for electric aircraft, power electronics in high power drive systems, high power electronic motor stand drives

**Learning Outcomes:**

At the end of this unit, the student will be able to

- To know about impact and challenges of Power Electronics to applications in Renewable Energy area **L1**
- To know about applications of Power Electronics in Solar Energy, Wind Energy, high power drive & Electric aircrafts **L2**

**UNIT – II: Power Quality and Converters** **10 Hrs**

AC-DC-AC Converters for Distributed Power Generation Systems & Power Quality problems. Overview of Power Electronics Converters, Bidirectional AC-DC-AC Topologies, Filters, PWM for AC-DC-AC topologies, Control of converters, selection and sizing of the Converters, Matrix converter, and Multilevel Converters, Power Quality and Electromagnetic conservation, Power Quality Issues, Matting Methods and EMC related Phenomena in Electrical Power systems.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- To know about AC-DC-AC converters for Distributed generation and Power Quality problems **L1**
- To understand about the selection and sizing of converters, EMC and multi level converters & Application **L2**

**UNIT – III: AC link Universal Power Converters** **10 Hrs**

Introduction, hard switching AC link universal power converter, soft switching AC link universal power converter, principle of operation of the soft switching AC link universal power converter, design procedure, analysis and applications

**Learning Outcomes:**

At the end of this unit, the student will be able to

- To know about advanced topic of AC link universal power converters **L1**
- To know about principle of operation of soft & hard switching converter **L2**

**UNIT – IV: High Power Electronics for Solar - Wind Systems** **10 Hrs**

Power converters for wind turbines, power semiconductors for wind power converter, Power converters for Grid connected Wind Energy Conversion System and Grid connected Solar Energy Converter systems, Hybrid Systems, Types of Cogeneration processes.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- To understand about high power drives for wind turbines & solar systems L1
- To distinguish between grid connected and off-grid connected systems, hybrid drive systems & co-generation processes. L2

**UNIT – V: Power Electronics For More Electric Aircraft**

**10 Hrs**

Introduction, electric aircraft, electric engine, electric power generation strategies, power electronics and power conversion, power distribution

**Learning Outcomes:**

At the end of this unit, the student will be able to

- To get exposed to the concept of electric aircraft used in aerospace, electric engine, electric power generation strategies. L1
- To know about applications of power electronics in electric aircraft and power conversion, power distribution L2

**Text Books:**

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

**Reference Books:**

1. Ewald F. Fuchs, Mohammad A.S. Masoum, Power Conversion of Renewable Energy Systems, Springer, 2012
2. Mukund R. Patel, Wind and Solar Power Systems: Design, Analysis, and Operation, Second Edition, Taylor & Francis, 2006

**Course Outcomes:**

At the end of this Course the student will be able to

- To identify specific applications of Power Electronics in certain alternate sources L1
- To understand about Power Quality problems as applied to Power Systems and the converters to be used L2
- To learn about analysis of UPC and its design and application L3
- To be able to understand designing of high power drives for wind turbines L4
- To get exposed to principle of electric aircraft and applications of power converters L5