

## B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE74b- POWER QUALITY

(Professional Elective-III)

L	T	P	C
3	0	0	3

**Course Objectives:** The objectives of the course are to make the students learn about

- To learn about voltage disturbances and power transients that is occurring in power systems
- To know about voltage sag and transient over voltages for quality of power supply
- To understand about harmonics and their mitigation
- To study about different power quality measuring and monitoring concepts.
- To know about long duration voltage variations

**UNIT – I: Power Quality Issues 10 Hrs**

Power quality, voltage quality, The power quality Evaluation procedure, Terms and Definitions, Transients, Long-duration voltage variations, short-duration voltage variations, voltage imbalance, wave form distortion, voltage fluctuation, power frequency variations, power quality terms CBEMA and ITI curves.

**Learning Outcomes:**

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

- To learn about various issues of power quality L1
- To know about the evaluation procedure of power quality issues L2

**UNIT – II: Voltage Sags and Transient Over Voltages**

10 Hrs

Sources of sags and interruptions, Estimating voltage sag performance, fundamental principles of protection, solutions at the end-use level, Motor-starting sags and utility system fault-clearing issues, sources of over voltages, principles of over voltage protection, devices for over voltage protection, utility capacitor-switching transients, utility system lightning protection.

**Learning Outcomes:**

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

- To understand what is meant by voltage sag L1
- To know about voltage sag performance estimations L2

**UNIT – III: Fundamentals of Harmonics**

10 Hrs

Harmonic sources from commercial and industrial loads, locating harmonic sources, Power system response characteristics, Harmonics Vs transients, Effect of harmonics, harmonic distortion, voltage and current distortion, harmonic indices, inter harmonics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive and active filters, IEEE and IEC Standards.

**Learning Outcomes:**

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

- To understand about effects of harmonics L1
- To distinguish between voltage and current harmonics L2

**UNIT – IV: Long-Duration Voltage Variations**

10 Hrs

Principles of regulating the voltage, Devices for voltage regulation, utility voltage regulator Application, capacitors for voltage regulation, End user capacitor applications, flicker.

**Learning Outcomes:**

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

- To know about principles of regulating the voltages L1
- To understand about the necessity of power electronic devices for voltage regulation L2

**UNIT – V: Power Quality Bench Marking and Monitoring**

**10 Hrs**

Benchmarking process, RMS Voltage variation Indices, Harmonic indices Power Quality Contracts, Monitoring considerations, power quality measurement equipment, Power quality Monitoring standards

**Learning Outcomes:**

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

- To know about what is meant by bench marking in power quality issues **L1**
- To identify and able to compute voltage variation indices **L2**

**Text Books:**

1. Electrical Power Systems Quality by Roger C. Dugan, Mark F.McGranaghan, Surya Santoso, H.WayneBeaty, 2nd Edition, TMH Education Pvt. Ltd, 2012
2. Power quality by C. Sankaran, CRC Press, 2017

**Reference Books:**

1. Electrical systems quality Assessment by J. Arrillaga, N.R. Watson, S. Chen, John Wiley & Sons, 2000.
2. Understanding Power quality problems by Math H. J. Bollen, Wiley-IEEE Press, 2000

**Course Outcomes:**

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

- To get knowledge about different power quality issues and to mitigate them **L1**
- Analyze voltage disturbances and power transients that are occurring in power systems. **L2**
- Understand the concept of harmonics in the system and their effect on different power system equipment. **L3**
- Able to understand the principles of regulation of long duration voltage variations **L4**
- To get knowledge about different power quality measuring and monitoring concepts **L5**