

## Faculty of Engineering & Technology

### Power Quality

**Information :**

**Course Code :** EPR 533

**Level :** Undergraduate

**Course Hours :** 3.00- Hours

**Department :** Specialization of Electrical Power Engineering

**Instructor Information :**

Title	Name	Office hours
Professor	Almoataz Youssef Abdelaziz Mohamed Abdelmaguied	8
Assistant Lecturer	Ahmed Moreab Hussien Mohamed	2

**Area Of Study :**

- Understand the fundamentals of power quality.
- Know the main terminology and standards of power quality.
- Apply different techniques of solving power quality problems.
- Know the measuring devices and methods for the power quality problems.

**Description :**

Power Quality Fundamentals: Definition, Terminology, Criteria, Standards. Voltage Sags: Characteristics, Mitigation, Voltage Fluctuations and Lamp Flicker. Power Frequency Disturbance: Disturbances, Low Frequency Disturbances, Voltage Tolerance Criteria - ITIC Graph. Electrical Transients: Modeling, Types and Causes. Harmonics: Voltage and Current Harmonics, Individual and Total Harmonic Distortion. Grounding and Bonding: NEC Requirements, Earth Resistance Tests, Earth Ground Grid Systems, Power Ground System. Power Factor: Power Factor Improvement, Synchronous Condensers, Static Var Compensators, Advantages of Power Factor Correction. Electromagnetic Interference; Electrical and Magnetic Fields, Power Frequency Fields, High Frequency Interference, EMI Terminology. Measuring and Solving Power Quality Problems: Measurement Devices, Test Locations, and Duration.

**Course outcomes :**

**a.Knowledge and Understanding: :**

1 -	a1- Summarize the concepts and basic principles of power quality.
2 -	a2- Describe solutions for different power quality problems, especially harmonic nature and power factor corrections, in various ways: verbally, graphically, and using simulation.
3 -	a3- Describes computer modeling, simulation, rendering and presentation of power quality items techniques.
4 -	a4- Explain the customer needs and requirements such as those regarding voltage levels and its related quality.

**b.Intellectual Skills: :**

1 -	b1- Express power quality ideas in structural and mathematic terms so that quantities evaluation is facilitated.
2 -	b2- Apply different alternative solutions for grounding and bonding methods.
3 -	b3- Decide the choice among different solution alternatives for power factor enhancement.
4 -	b4- Evaluate obtained results of using power quality devices such as harmonic filters.

**c. Professional and Practical Skills: :**

1 -	Ability to integrate knowledge and understanding of mathematics, information technology, design and engineering concepts to design and plan electrical systems to solve problems.
2 -	Conduct research and collect data from different resources.
3 -	Use appropriate techniques for representation.

**d. General and Transferable Skills: :**

1 -	d1- Write reports in accordance with standard scientific guidelines.
2 -	d2- Work in a self-directed manner.
3 -	d3- Work coherently and successfully as a part of a team.
4 -	d4- Carry out solutions for problems using innovative thinking.

**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction	5	3	2
Power Quality Fundamentals: Terms and Definitions	15	9	6
Voltage Sags and Interruptions	10	6	4
Electrical Transients	11	6	5
Voltage Regulation	10	6	4
Power Factor Improvement	10	6	4
Harmonics	14	9	5

**Teaching And Learning Methodologies :**

Interactive Lecture  
Small Group Discussion  
Public Group Discussion

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Final exam	40.00		to assess the performance of students during the course
o Mid-Term exams	30.00		
o Quizzes, class participation, reports, and Assignments	30.00		

**Course Notes :**

No course notes are required

**Recommended books :**

- 1- R. C. Dugan, M. F. McGranaghan, S. Santoso and H. W. Beaty, **Electrical Power Systems Quality** 3rd Edition, McGraw Hill, 2012.
- 2- C. Sankaran, **Power Quality** CRC Press, 2002.
- 3- Alexander Kusko and Marc T. Thompson, **Power Quality in Electrical Systems** McGraw Hill, 2007.