SCHEME OF COURSE WORK

Course Details:

Course Title	**: ELECTRICAL POWER QUALITY**		
Course Code	**: 13EE1124**	**L T P C**	**: 4 0 0 3**
Program:	**: B.Tech.**		
Specialization:	**: Electrical and Electronics Engineering**		
Semester	**: VI**		
Prerequisites	**: Basic knowledge in Electrical Networks, Machines, Power Electronics**		
Courses to which it is a prerequisite	**:**		

Course Outcomes (COs):

After completion of the course student acquire knowledge in

1	Define different power quality issues and disturbances.
2	Analyze electrical transient system model and give examples of different types.
3	Describe various grounding and bonding methods.
4	Describe causes and mitigation of harmonics.
5	Measure and solve different power quality problems and describe various custom power devices.

Program Outcomes (POs):

A graduate of Power System Control & Automation will be able to

1	Be on par with those from any advanced institution
2	Take up any job either in the core industry (or) in allied disciplines
3	Fit to write any competitive examinations for getting selected either for M.S. program (or) to undertake relevant career at a high end
4	Develop a techno ethical personality that makes him serve the people in general & Electrical & Electronics Engineering in particular
5	Enable the students adopt themselves in any socio-technological situation
6	Develop communication and leadership skills so that the candidates in their future become leaders in the industry & academia
7	Make students do projects either of fundamental nature (or) of the ones useful to industry such that in either case they enter the frontiers of research
8	Have a basic capability to analyze and /or design an electrical & electronics system and be useful to the community in general
9	Function effectively as an individual and also as a member and leader in diverse teams
10	Communicate effectively problems of his discipline to the experts of other disciplines
11	Have sufficient working knowledge in IT tools for him to correctly model the system and predict the solution

Course Outcome Versus**Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	S	S	M					M			
CO-2	S	S	M			M	M	M			
CO-3	S	S	M		M	M	M				
CO-4	S	S	M		M						
CO-5	S	S	M		M			M			

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

AssessmentMethods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Introduction, power quality issues, remedial measures, power quality vs equipment immunity, power quality concerns, power quality standards, power quality monitoring, common power frequency disturbances, source of steady state disturbances, the effect of steady state disturbance on loads, techniques to reduce disturbances	CO-1	What are the power quality issues and ?	▫ Lecture ▫ Discussion	Mid-Test 1 (Week 9) Seminar (Week 1)
2	Introduction, Transient System Model, Examples of Transient Models and Their Response, Power System Transient Model, Types and Causes of Transients, Examples of Transient Waveforms	CO-2	Explain types and causes of transients?	▫ Lecture ▫ Discussion	
3	Introduction, Shock And Fire Hazards, National Electrical Code Grounding Requirements, Essentials of a Grounded System, Ground Electrodes, Earth Resistance Tests, Earth-Ground Grid Systems, Power Ground System, Signal Reference Ground, Signal Reference Ground Methods, Single Point And	CO-3	What is the importance of grounded system? Also give Examples of Grounding Anomalies	▫ Lecture ▫ Discussion	

	Multipoint Grounding, Ground Loops, Electrochemical Reactions Due To Ground Grids, Examples of Grounding Anomalies or Problems Electromagnetic Interference Terminology, EMI Mitigation				
4	Definition of Harmonics, harmonic number (h) , odd and even order harmonics, harmonic phase rotation and phase angle relationship, causes of voltage and current harmonics, individual and total harmonic distortion, harmonic signatures, effect of harmonics on power system devices, guidelines for harmonic voltage and current limitation, harmonic current mitigation	CO-4	What are the effects of harmonics on power system devices?	▫ Lecture ▫ Discussion	
5	Introduction, power quality measurement devices, power quality measurements, number of test locations, test duration, instrument setup and guidelines**.** Dynamic Voltage Restorer (DVR), D-STATCOM, Unified Power Quality Conditioner (UPQC), Unified Power Quality Conditioner based on current source convert topology, principles, configuration and types of Uninterruptable Power Supplies (UPS).	CO-5	Explain principles, configuration and types of Uninterruptable Power Supplies	▫ Lecture ▫ Discussion	