Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Electrical and Electronics Engineering
BEE044 and POWER QUALITY MANAGEMENT
Seventh Semester (Odd Semester)

Course (catalog) description

To study the various issues affecting Power Quality, their production, monitoring and Suppression.

Compulsory/Elective course: Elective for EEE students

Credit hours : 3 credits & 45hrs

Course Coordinator : Mr.S.P.Vijayaragavan

Instructors **:** Mrs.G.Hemavathi

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Mrs.G.Hemavathi	Final year EEE	KS 303	04422290125	Vijayaragavan @bharathuniv.ac.in	12.00 to 12.30 pm

Relationship to other courses:

Pre –requisites **:** BEE601-Transmission and Distribution

Syllabus Contents

UNIT I INTRODUCTION TO POWER QUALITY **9**

Power Quality phenomenon-Terms and definitions-Various Power events in power quality - causes for reduction in power quality

UNIT II VOLTAGE SAGS **9**

Sources of sags – Magnitude & duration of sag-effect of sag on computer and consumer Electronics- Monitoring and mitigation of voltage sag.

UNIT III INTERRUPTIONS **9**

Origin of Long & Short interruption –influence on various equipments-Basic reliability indices -monitoring and mitigation of interruption

UNIT IV HARMONICS **9**

Harmonic distortion: Voltage and current distortion- harmonic indices- harmonic sources from commercial and industrial loads- Effects of harmonics on various equipments- harmonic distortion evaluation- Devices for controlling harmonic distortion

UNIT V POWER QUALITY MONITORING **9**

Monitoring considerations: Power line disturbance analyzer, power quality measurement equipment, harmonic spectrum analyzer, flicker meters, disturbance analyzer

Text Books:

1. Arindam Ghosh, "Power Quality Enhancement Using Custom Power Devices Power Quality Enhancement Using Custom Power Devices", Springer, 2002.
2. Roger.C. Dugan, Mark .F. McGranagham, Surya Santoso, H.Wayne Beaty, "Electrical Power Systems Quality" McGraw Hill, 2003.

References:

1. Math H.J.Bollen, "Understanding Power Quality Problems-Voltage sag &Interruptions", IEEE Press, 2000.
2. http://nptel.ac.in/courses/108106025/

Computer usage: **Nil**

Professional component

General	0%
Basic Sciences	0%
Engineering sciences & Technical arts	0%
Professional subject	0%
Major elective	100%

Broad area : Circuit theory |Electrical machines | Electronic | **Power system** | Control & Instrumentation

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2nd week	Session 15 to 28	2 Periods
3	Model Test	October 2nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

To study the various issues affecting Power Quality, their production, monitoring and Suppression.	Correlates to program outcome		
	H	**M**	**L**
1. To study various methods of power quality monitoring.	b,d,	a,c,e,g,l,j,l	f,h,k
2.To Study the production of voltages sags.	b,c,d,e,f,	a,g,l,j,l	h,k
3. To Study the interruptions types and its influence in various components.	b,c,d,e,f,	a,j,l,l	h,k
4. To Study the Effects of harmonics on various equipment's.	b,c,d,e,f	a,l,j,l	h,k

5. Understand power quality monitoring and classification techniques.	b,e	a,c,d,e,f,g,l,j,l	h,k

H: high correlation, M: medium correlation, L: low correlation

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I			
1.	Power Quality phenomenon	YES	T1,T2
2.	Terms and definitions	YES	
3.	Various Power events in power quality	YES	
4.	causes for reduction in power quality	YES	
5.	voltage sag	YES	
6.	voltage swell	YES	
7.	voltage imbalance	YES	
8.	voltage fluctuation	YES	
9.	International standards of power quality	YES	
UNIT II			
10.	Sources of sags	NO	T1,T2
11.	Magnitude & duration of sag-effect of sag on computer and consumer Electronics	YES	
12.	Monitoring and mitigation of voltage sag.	YES	
13.	analysis and calculation of various faulted condition	YES	
14.	Estimation of the sag severity	YES	
15.	mitigation of voltage sags, active series compensators.	YES	
16.	Static transfer switches	YES	
17.	fast transfer switches.	YES	
18.	Voltage sag due to induction motor	YES	
UNIT III			
19.	Origin of Long & Short interruption	YES	T1,T2
20.	influence on various equipments-Basic reliability indices	YES	
21.	monitoring and mitigation of interruption	NO	
22.	Harmonic sources from commercial	NO	
23.	industrial loads	YES	
24.	locating harmonic sources.	NO	
25.	Power system	NO	
26.	Harmonics Vs transients.	YES	
27.	Effect of harmonics	YES	
28.	harmonic distortion - voltage and current distortion	YES	
UNIT IV			
29.	Harmonic distortion: Voltage and current distortion	YES	
30.	harmonic indices	YES	
31.	harmonic sources from commercial and industrial loads	YES	

32.	Effects of harmonics on various equipments	YES	T1,T2
33.	harmonic distortion evaluation	NO	
34.	Devices for controlling harmonic distortion	NO	
35.	devices for controlling harmonic distortion	NO	
36.	passive and active filters.	YES	
37.	IEEE and IEC	YES	
38.	TEST	NO	
UNIT V			
39.	Monitoring considerations: Power line disturbance analyzer	YES	T1,T2
40.	power quality measurement equipment	YES	
41.	harmonic spectrum analyzer	YES	
42.	flicker meters,	NO	
43.	disturbance analyzer.	NO	
44.	Applications of expert systems for power quality monitoring.	NO	
45.	Review of Unit V	YES	

Draft Lecture Schedule

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by: Mr.Vijayaragavan **Dated :**

Addendum

ABET Outcomes expected of graduates of B.Tech / EEE / program by the time that they graduate:

a) An ability to apply knowledge of mathematics, science, and engineering fundamentals.

b) An ability to identify, formulate, and solve engineering problems.

c) An ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d) An ability to design and conduct experiments, as well as to analyze and interpret data.

e) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

f) An ability to apply reasoning informed by the knowledge of contemporary issues.

g) An ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

h) An ability to understand professional and ethical responsibility and apply them in engineering practices.

i) An ability to function on multidisciplinary teams.

j) An ability to communicate effectively with the engineering community and with society at large.

k) An ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.

l) An ability to recognize the need for,and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION
Electrical Engineering Graduates are in position with the knowledge of Basic Sciences in general and Electrical Engineering in particular so as to impart the necessary skill to analyze and synthesize electrical circuits, algorithms and complex apparatus.

PEO2: CORE COMPETENCE
Electrical Engineering Graduates have competence to provide technical knowledge, skill and also to identify, comprehend and solve problems in industry, research and academics related to power, information and electronics hardware.

PEO3: PROFESSIONALISM
Electrical Engineering Graduates are successfully work in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.

PEO4: SKILL
Electrical Engineering Graduates have better opportunity to become a future researchers/ scientists with good communication skills so that they may be both good team-members and leaders with innovative ideas for a sustainable development.

PEO5: ETHICS
Electrical Engineering Graduates are framed to improve their technical and intellectual capabilities through life-long learning process with ethical feeling so as to become good teachers, either in a class or to juniors in industry.

Course Teacher	Signature
Mrs.G.Hemavathi	

Course Coordinator **HOD/EEE**

(Mr.Vijayaragavan) ( )