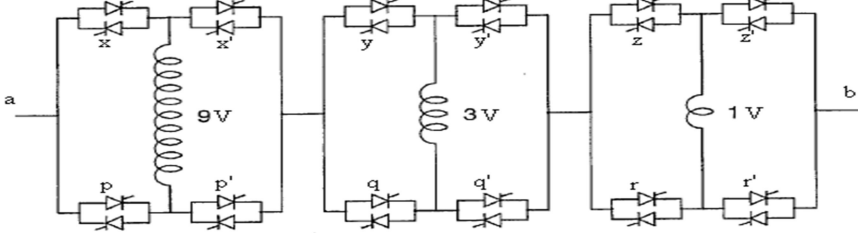**Course Name :- Power Quality & FACTS (BEET701)**
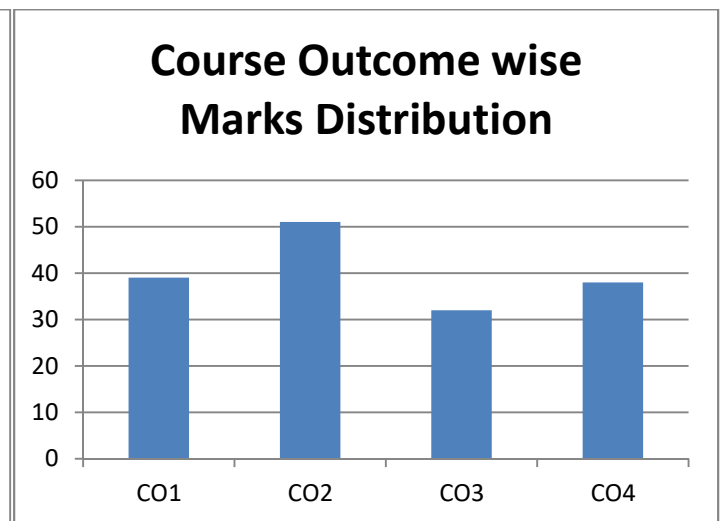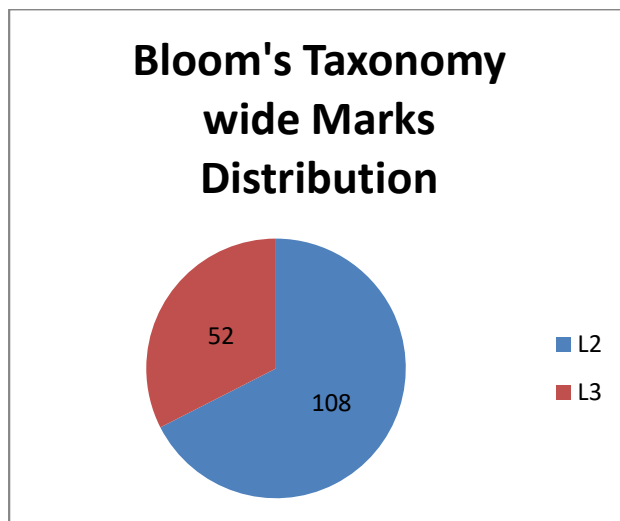
Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the characteristic of ac transmission and the effect of shunt and series reactive compensation,
2. Understand the working principle of FACTS devices and their operating characteristics,
3. Understand the basic concepts of Power Quality,
4. Understand the working principles of devices to improve power quality.

Model Question paper

Q.No.	Questions	Marks	CO	BL	PI
1a	Explain the various types of limits of a transmission line for AC power transmission.	6	CO1	L2	1.2.1
1b	Derive the expression for real and reactive power flow through a line, considering the resistance of the line negligible as compared to the line reactance.	7	CO1	L2	1.2.1
1c	Describe the basic working principle of TCSC, with relevant circuit diagram and control mechanism.	7	CO2	L2	4.1.1
2a	Explain the Hybrid shunt compensators with the operating characteristics.	4	CO2	L2	4.1.1
2b	Describe the classification of high power voltage source converters for high voltage AC transmission.	6	CO3	L2	2.2.2
2c	Explain the principle of space vector PWM technique with relevant diagram.	10	CO3	L2	1.3.1
3a	Define and explain the following terms:- i. Amplitude modulation index ii. Frequency modulation index iii. Dead time effect iv. CBEMA curve.	10	CO3	L2	1.3.1
3b	Describe the principle of selected harmonic elimination PWM technique with an example.	10	CO2	L3	1.3.1
4a	Explain the principle of static phase shifting transformers and their application in AC transmission system.	10	CO4	L3	1.2.1
4b	Write down a brief note on terms below : i. Voltage stability ii. Sub-synchronous resonance	10	CO2	L2	1.2.1
5a	Describe the operating principle and various control schemes for SSSC, with block diagram.	10	CO4	L3	2.1.1
5b	Explain the basic types of power quality issues of an electrical power system with the relevant waveforms.	10	CO4	L2	2.3.1
6a	Describe the principle of operation of UPFC with the schematic diagram.	8	CO4	L2	2.3.1
6b	Explain how a shunt compensator and series compensator can improve the transient stability of the power system, with relevant assumptions.	8	CO2	L2	2.1.2
6c	An Static VAR Compensator (SVC) of 5x 4kVAR capacitive rating is installed at a bus. If the required kVAR at an instant is 13kVAR what will be the on-off state of each part of the SVC.	4	CO2	L2	1.3.1
7a	A 3-bus system has two generators with real power generation of	6	CO1	L2	1.3.1

	2000 MW at bus 1 and 1000 MW at bus 2 and load of 3000 MW at bus 3. Suppose line 1-2, 2-3 and 1-3 have continuous rating of 1000 MW, 1250 MW and 2000 MW respectively and line reactance of 10 ohm, 5 ohm and 10 ohm respectively.				
7b	A 3-phase, 500 kV, 1800 MVA transmission line of length 200 km require a series compensator to be installed of 25% of line rating. Find the power and voltage rating of the series compensator. Consider 1%/10km voltage drop.	6	CO1	L2	1.3.1

7c	Write down the definition of the following:-
	    i. STATCOM
	    ii. FACTS controller
	    iii. IPFC
	    iv. TCPST or SPST
		8	CO1	L3	2.4.4

8a	What will be the uumber of steps and magnitude of the output voltage across terminals a and b. How the output voltage can be 7V and 11V across terminals a and b.	6	CO3	L2	1.3.1
8b	Give a brief comparison of HVDC and FACTs technology of high power transmission along with possible benefits from FACTS technology.	6	CO1	L3	2.4.4
8c	Describe the basic principle of Phase angle regulator and voltage regulator for AC transmission system.	8	CO2	L3	2.4.4

Bloom's Taxonomy wide Marks Distribution

- L2: 108
- L3: 52

Course Outcome wise Marks Distribution

(Bar chart values approximately: CO1 = 39, CO2 = 51, CO3 = 32, CO4 = 38)

BL - Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3- Applying, 4- Analyzing, 5- Evaluating, 6 Creating)

CO – Course Outcomes

PO – Program Outcomes; PI Code – Performance Indicator Code.