Ref No:

< Sri Krishna Institute of Technology, Bengaluru>

COURSE PLAN

Academic Year 2018-2019

Program:	B E – Electrical & Electronics Engineering
Semester :	2nd
Course Code:	18ELEL27
Course Title:	Basic Electrical Engineering Laboratory
Credit / L-T-P:	1 / 0-0-2
Total Contact Hours:	30
Course Plan Author:	AVINASH S

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Note : Remove “Table of Content” before including in CP Book
Each Laboratory Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

18ELEL27 : BASIC ELECTRICAL ENGINEERING LAB

A. LABORATORY INFORMATION

1. Lab Overview

Degree:	B.Tech	*Program:*	EE
Year / Semester :	1 / 1	*Academic Year:*	2019-20
Course Title:	Basic Electrical Engineering Lab	*Course Code:*	18ELEL27
Credit / L-T-P:	1 / 0-0-2	*SEE Duration:*	180 Minutes
Total Contact Hours:	30 Hrs	*SEE Marks:*	60 Marks
CIA Marks:	40	*Assignment*	1 / experiment
Course Plan Author:	Mr. Avinash S	*Sign*	Dt :
Checked By:		*Sign*	Dt :

2. Lab Content

Unit	Title of the Experiments	Lab Hours	Concept	Blooms Level
1	VERIFICATION OF KCL AND KVL FOR DC CIRCUITS.	3	DC circuits	L3
2	MEASUREMENT OF CURRENT, POWER AND POWER FACTOR OF INCANDESCENT LAMP, FLUORESCENT LAMP AND LED LAMP	3	Measurements of Electrical Quantities	L2
3	MEASUREMENT OF RESISTANCE AND INDUCTANCE OF A CHOKE COIL USING 3-VOLTMETER METHOD	3	Choke Coil	L2
4	DETERMINATION OF PHASE AND LINE QUANTITIES IN THREE PHASE STAR AND DELTA CONNECTION	3	Star-delta connection	L3
5	MEASUREMENT OF THREE PHASE POWER USING TWO WATTMETER METHOD	3	3phase power	L2
6	TWO WAY AND THREE WAY CONTROL OF LAMP	3	Lamp control	L2
7	MEASUREMENT OF EARTH RESISTANCE	3	Earth resistance	L2
8	STUDY OF EFFECT OF OPEN AND SHORT CIRCUITS IN SIMPLE CIRCUITS	3	OC & SC	L2

3. Lab Material

Expt.	Details	Expt. in book	Availability
A	**Text books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
2,6,7,9,10	1 Basic Electrical Engineering D C Kulshreshtha Tata McGraw Hill, Revised First Edition	-	In Lib / In Dept
1,3,4,5,8,11,12	2 Principles of Electrical Engineering & Electronics V.K. Mehta, Rohit S.ChandPublications	-	In Lib/ In dept
B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
12	1 Fundamentals of Electrical Engineering and Electronics B. L. Theraja S. Chand & Company Ltd, Reprint Edition 2013.	-	In Lib
8,	2 Electrical Technology E. Hughes International Students 9th Edition, Pearson, 2005	-	In Lib

3	3 Basic Electrical Engineering D. P. Kothari and I. J. Nagrath Tata McGraw Hill, 2017.	-	In lib
C	**Concept Videos or Simulation for Understanding**	**-**	**-**
	Ohm's law by Dc circuits https://www.youtube.com/watch?v=liLJj7NS4DI		
	Measurement of electrical quantities of different lamps		
	Resistance and Inductance of choke coil https://www.youtube.com/watch?v=lY_jtjjFklM		
	Control methods of Lamps https://www.youtube.com/watch?v=6z-R7pZUIds		
	Star and Delta connection https://www.youtube.com/watch?v=9b17eqCT4-g https://www.youtube.com/watch?v=9b17eqCT4-g		
	Measurements of 3 phase power https://www.youtube.com/watch?v=0BMU1qLzFhg https://www.youtube.com/watch?v=784LkH03L1E		
	Earth Resistance https://www.youtube.com/watch?v=aXhT9UT9Ld8 https://www.youtube.com/watch?v=M3fWNAIKGaM		
	OC and SC test https://www.youtube.com/watch?v=_wevDhc_rG0 https://www.youtube.com/watch?v=9hBmgdGjt1Y		
D	**Software Tools for Design**	**-**	**-**
	-		
E	**Recent Developments for Research**	**-**	**-**
F	**Others (Web, Video, Simulation, Notes etc.)**		
	Nptel online video lecture	Www.onlinecourses.nptel.ac.in	Nptel online video lecture

4. Lab Prerequisites:

-	-	Base Course:		-	-
SNo	Course Code	Course Name	Topic / Description	Sem	Remarks
		-	-		

Note: If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

5. General Instructions

SNo	Instructions	Remarks
1	Observation book and Lab record are compulsory.	
2	Students should report to the concerned lab as per the time table.	
3	After completion of the program, certification of the concerned staff in-charge in the observation book is necessary.	
4	Student should bring a notebook of 100 pages and should enter the readings /observations into the notebook while performing the experiment.	
5	The record of observations along with the detailed experimental procedure of the experiment in the Immediate last session should be submitted and certified staff member in-charge.	
6	Should attempt all problems / assignments given in the list session wise.	
7	It is responsibility to create a separate directory to store all the programs, so	

	that nobody else can read or copy.	
8	When the experiment is completed, should disconnect the setup made by them, and should return all the components/instruments taken for the purpose.	
9	Any damage of the equipment or burn-out components will be viewed seriously either by putting penalty or by dismissing the total group of students from the lab for the semester/year	
10	Completed lab assignments should be submitted in the form of a Lab Record in which you have to write the algorithm, program code along with comments and output for various inputs given	

6. Lab Specific Instructions

SNo	Specific Instructions	Remarks
1	Students are expected to study the circuit, theory and procedures, expected output before doing the experiment.	
2	Multi-meter adjustments:- a. Set the right mode before taking the readings. b. For current reading, connect the multimeter in mA (or A) mode to the circuit before switching on the supply. Do not remove the current meter when the supply is on. Check for ac and dc modes as required. c. For voltage reading ensure that proper ac or dc setting. d. Use the proper leads for the measurement. Wrong cables damage the instrument.	
3	Don't pull out the connections with the power supply on.	
4	Wear your College ID card Do not operate the IC trainer kits without permission	
5	Avoid loose connection and short circuits	
6	Do not panic if you do not get the output	
7	After completion of the experiment switch off the power and return the components	

B. OBE PARAMETERS

1. Lab / Course Outcomes

#	Lab Code #	COs	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
1	18ELEL27.1	Analysis of DC circuits by using KVL & KCL	3	DC circuits	Conduction demo	Viva & test	L3
2	18ELEL27.2	Analysis the incandescent lamp, FL, LED lamp & measure the current,power & power factor	3	measurements	Conduction demo	Viva & test	L2
3	18ELEL27.1	Analysis the chokecoil & measurement of resistance & inductance by using 3 voltmeter method	3	Chock coil	Conduction demo	Viva & test	L2
4	18ELEL27.3	Determine phase & line voltage by using star delta connection	3	Star delta connection	Conduction demo	Viva & test	L3
5	18ELEL27.3	Determine the power in electric circuit by using 3phase load.	3	3phase power	Conduction demo	Viva & test	L2
6	18ELEL27.4	Understand lamp,switches & lamp controller by two way & three way switches	3	Lamp control	Conduction demo	Viva & test	L2
7	18ELEL2	Determine earth resistance by using	3	Earth	Conduc	Viva & test	L2

	7.4	Erath Tester		resistance	tion demo		
8	18ELEL27.1	Study the circuit & effect of OC & SC circuits	3	OC &SC circuits	Conduction demo	Viva & test	L2
-		**Total**		-	-	-	-

Note: Identify a max of 2 Concepts per unit. Write 1 CO per concept.

2. Lab Applications

SNo	Application Area	CO	Level
1	The practical application of KCL and KVL is to determine the amount of current flowing through individual electronic component in a circuit and voltage drop in each one. Using that law we can manipulate voltage and current to the component by controlling resistance to it. https://www.youtube.com/watch?v=cUu81ISbD6o	CO1	L3
2	In Lighntings	CO2	L2
3	Used in fluorescent lamps	CO1	L2
4	Used in residential, appartments and in industries.	CO3	L3
5	Used in connection of various loads.	CO3	L2
6	Used to measure 3phase power.	CO4	L2
7	To measure earth resistance.	CO4	L2
8	Used to calculate transformer losses.	CO1	L2

Note: Write 1 or 2 applications per CO.

4. Articulation Matrix

(CO – PO MAPPING)

-	Course Outcomes	Program Outcomes															
CO Number	**At the end of the course student should be able to .. .**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Level
CO1	Identify the common electrical components and measuring instruments used for conducting experiments in the electrical Laboratory.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-	L3
CO2	Compare power factors of lamp..	3	1	-	-	-	-	-	-	-	-	-	-	2	-	-	L3
CO3	Determine the Electrical quantities of an electrical circuit and power consumed in a 3 phase load.	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-	L3
CO4	Determine earth resistance and understand two way and three way control of lamps	2	-	-	-	-	-	2	-	-	-	-	-	1	-	-	L2
ELE23PC	**Average attainment (1, 2, or 3)**																-
PO, PSO	*1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design*																

Lecture 17	*PSO 1: Apply fundamental knowledge to identify, formulate, design and investigate various problems of electrical and electronic circuits, power electronics, and power systems.* *PSO 2: Use latest Electrical and Electronics related softwares for simple design, drafting, manufacturing, maintenance and documentation of Electrical and Electronics components .* *PSO 3: Manage the Electrical process by selection and scheduling right type of machinery, Conductors, Electrical equipment, power quality control techniques, operational parameters and softwares for a particular power transmission process to achieve reliability and economical operation.*

Note: Mention the mapping strength as 1, 2, or 3

C. COURSE ASSESSMENT

Continuous Internal Assessment (CIA)

Evaluation	Weightage in Marks	CO	Levels
CIA Exam – 1	40	CO1, CO2, CO3,	L2, L3
CIA Exam – 2	40	CO1 ,CO3, CO4,	L2, L3 . .
CIA Exam – 3	40	CO1, CO2, CO3, CO4,	L2, L3 . .
Other Activities – define – Slip test		CO1 to Co49	L2, L3..
Final CIA Marks	**40**	**-**	**-**

-

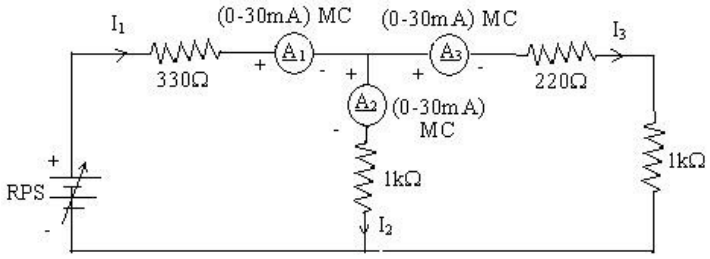
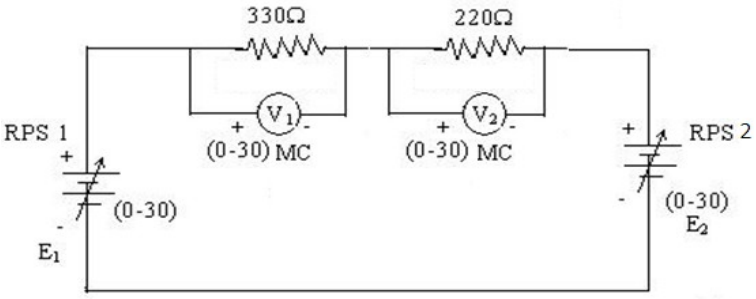
SNo	Description	Marks
1	Observation and Weekly Laboratory Activities	15 Marks
2	Record Writing	15 Marks for each Expt
3	Internal Exam Assessment	10 Marks
4	Internal Assessment	40 Marks
5	SEE	60 Marks
-	**Total**	**100 Marks**

D. EXPERIMENTS

Experiment 01 : VERIFICATION OF KCL AND KVL FOR DC CIRCUITS.

-	**Experiment No.:**	1	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	VERIFICATION OF KCL AND KVL FOR DC CIRCUITS						
2	Course Outcomes	Able to verify Electrical Laws.						
3	Aim	VERIFICATION OF KCL AND KVL FOR DC CIRCUITS						
4	Material / Equipment Required	Lab Manual						

Sl.No.	Apparatus	Range	Quantity
1	RPS (regulated power supply)	(0-30V)	2
2	Resistance	330⌖, 220⌖ 1k⌖	6
3	Ammeter	(0-30mA)MC	3
4	Voltmeter	(0-30V)MC	3

		5 Bread Board & Wires -- Required
5	Theory, Formula, Principle, Concept	The practical application of KCL and KVL is to determine the amount of current flowing through individual component in a circuit and voltage drop across each component. These laws are applicable for both DC and AC circuits. Kirchhoff's Current Law: It states that "In any electrical network the algebraic sum of currents meeting at a node is zero." **ΣI = 0** Kirchhoff's Voltage Law: It states that "The algebraic sum of product of current and resistance in each of the conductors in any closed path in a network plus the algebraic sum of the e.m.f.s. in the closed path is zero." **ΣIR+Σ E.M.F =0**
6	Procedure, Program, Activity, Algorithm, Pseudo Code	Procedure for KCL: 1. Connections are made as per the circuit diagram. 2. Set a particular value in RPS. 3. Note down the corresponding ammeter reading. 4. Repeat the same for different voltages. Procedure for KVL: 1. Connections are made as per the circuit diagram. 2. Set a particular value in RPS. 3. Note all the voltage reading. Repeat the same for different voltages.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	 
8	Observation Table, Look-up Table, Output	Tabular Column for KCL

Voltage E	Current			Practical Value	Theoretical Value
	I_1	I_2	I_3	$I_1 = I_2 + I_3$	
Volts	mA	mA	mA	mA	mA
5					
10					
15					

	Lecture 17 ...	20 25

Tabular column for KVL

Input Voltage		Voltage Drops		Practical Value	Theoretical Value
E_1	E_2	V_1	V_2	$E_1 - E_2 = V_1 + V_2$	
Volts	Volts	Volts	Volts	Volts	Volts
3	2				
5	4				
7	6				
10	8				
15	10				

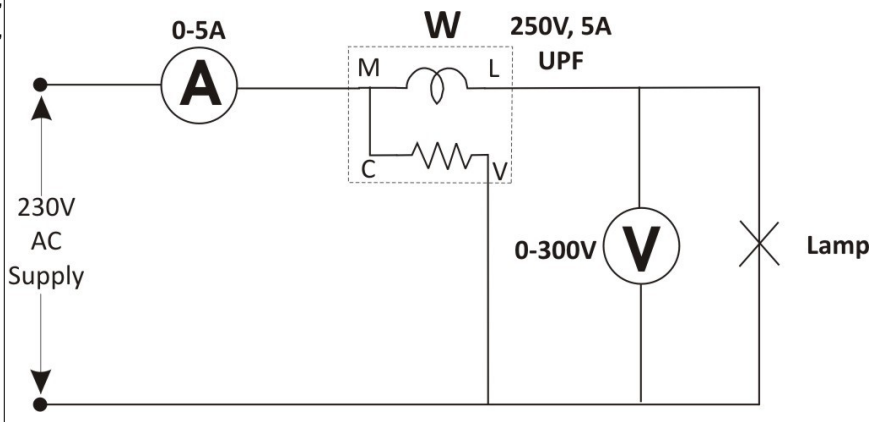
9	Sample Calculations	1. $I_1 = I_2 + I_3$ 2. $E_1 - E_2 = V_1 + V_2$
10	Graphs, Outputs	
11	Results & Analysis	Thus Kirchoff's voltage law and Kirchoff's current law are verified theoretically as well as practically.
12	Application Areas	They can be used to analyze any electrical circuit. Computation of current and voltage of complex circuits.
13	Remarks	
14	Faculty Signature with Date	

Experiment 02 : MEASUREMENT OF CURRENT, POWER AND POWER FACTOR OF INCANDESCENT LAMP, FLUORESCENT LAMP AND LED LAMP

-	**Experiment No.:**	2	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	MEASUREMENT OF CURRENT, POWER AND POWER FACTOR OF INCANDESCENT LAMP, FLUORESCENT LAMP AND LED LAMP						
2	Course Outcomes	Able to find less power consumption in various loads						
3	Aim	Measurement of current, power and power factor of incandescent lamp, fluorescent lamp and LED lamp.						
4	Material / Equipment Required	Lab Manual						

Sl.No.	Apparatus	Range	Quantity
1	Ammeter	(0-5A)	1
2	Voltmeter	(0-300V)	1
3	Wattmeter	250V, 5A, UPF	1
4	Bread Board & Wires	--	Required
5	Incandescent lamp, fluorescent lamp and LED lamp		1 each

5	Theory, Formula, Principle, Concept Figure 17...	In electrical engineering, the **power factor** of an AC electrical power system is defined as the ratio of the real power flowing to the load to the apparent power in the circuit. Real power is the capacity of the circuit for performing work in a particular time. Apparent power is the product of the current and voltage of the circuit. In an electric power system, a load with a low power factor draws more current than a load with a high power factor for the same amount of useful power transferred. **Incandescent light bulb**: is an electric light with a wire filament heated to such a high temperature that it glows with visible light (incandescence). The filament is protected from oxidation with a glass or fused quartz bulb that is filled with inert gas or a vacuum. In a halogen lamp, filament evaporation is slowed by a chemical process that redeposit' s metal vapor onto the filament, thereby extending its life. **Fluorescent lamp**: is a low-pressure mercury-vapor gas-discharge lamp that uses fluorescence to produce visible light. An electric current in the gas excites mercury vapor, which produces short-wave ultraviolet light that then causes a phosphor coating on the inside of the lamp to glow. A fluorescent lamp converts electrical energy into useful light much more efficiently than incandescent lamps. The typical luminous efficacy of fluorescent lighting systems is 50–100 lumens per watt, several times the efficacy of incandescent bulbs with comparable light output. Operation of Fluorescent lamp: When the supply is switched ON, heat is produced due to glow discharge between electrodes of starter is sufficient to bend bimetallic strip until it makes contact with fixed electrode. Thus circuit, between two electrode F1 & F2 is completed & relatively large current circulated through them. The electrodes are then heated to incandescence by this circulating current& gas in their immediate vicinity is ionized. After a second or two, due to absence of glow discharge a bimetallic strip cools sufficiently. **Choke:** 1. It provides a necessary high voltage to start discharge in the tube. 2. Since the voltage required across the tube during normal operation is small, the excess voltage appears as drop across the choke. 3. It acts as a stabilizer. **Starter:** The Starter is a switch that is normally closed, that opens a few seconds after power is applied. When the Starter opens, current flows through the tube and it lights up by ionizing the gas. **LED lamp**: is an electric light for use in light fixtures that produces light using light-emitting diode (LED). LED lamps have a lifespan and electrical

	Structure	efficiency which are several times greater than incandescent lamps, and are significantly more efficient than most fluorescent lamps.
6	Procedure, Program, Activity, Algorithm, Pseudo Code 17	1. Make the connections as shown in the circuit diagram. 2. Connect an incandescent lamp & apply 230 V supply. 3. Take the readings of ammeter, voltmeter and wattmeter. 4. Ammeter reads the current consumed by lamp. 5. Wattmeter reads the power consumed by lamp. 6. Calculate power factor of lamp using the formula. 7. Repeat the same procedure for fluorescent lamp and LED lamp.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	**TABULATION:** Types of loads | Voltage Applied a/c Lamp V volts | Current through the lamp I Amps | Power consumed by Lamp W watts | Power factor Incandescent lamp Fluorescent lamp LED lamp
9	Sample Calculations	$Power\ factor = \frac{Wattmeter\ Reading}{Voltmeter\ Reading \times Ammeter\ Reading}$
10	Graphs, Outputs	
11	Results & Analysis	The electrical quantities such as current, power and power factor of incandescent, fluorescent and LED lamps has been calculated. It is observed that LED lamp has a good power factor and draws less current for the same amount of useful power transferred compare to the other lamps.
12	Application Areas	In Lighntings
13	Remarks	
14	Faculty Signature with Date	

Experiment 03 : MEASUREMENT OF RESISTANCE AND INDUCTANCE OF A CHOKE COIL USING 3-VOLTMETER METHOD

-	Experiment No.:	1	Marks		Date Planned		Date Conducted	
1	Title	MEASUREMENT OF RESISTANCE AND INDUCTANCE OF A CHOKE COIL USING 3-VOLTMETER METHOD						
2	Course Outcomes	Able to find the passive elements of choke coil..						
3	Aim	To measure parameters of a choke coil in a single phase A.C. circuit by using three voltmeter method.						
4	Material / Equipment Required	Lab Manual						

S.No	Apparatus	Range	Quantity
1	Choke coil	230 V, 0.39A	1 No
2	Voltmeter	0-300V	3 Nos
3	Ammeter	0-2000mA	1 No
4	(Variac) Autotransformer	230V/0-270V,2A	1 No
5	Rheostat	100 /1A	1No

5 Theory, Formula, Principle, Concept

In electronics, a **choke** is an inductor used to block higher-frequency alternating current (AC) in a circuit. A choke coil is represented by a pure inductance (L) in series with equivalent resistance (r).The choke coil parameters can be measured using 2 methods:3-voltmeter method&3-Ammeter method .In addition to this these methods used to measure the quality factor and power absorbed by the given choke coil. The lower the value of resistance(r), better the quality of the coil. The Quality factor or the Q factor of an inductor at the operating frequency ω is defined as the ratio of reactance of the coil to its resistance.

Power consumed by load= $P=V_L I_L \cos Ø$

Power factor,

$$\cos Ø = \frac{V_S^2 - V_R^2 - V_L^2}{2V_R V_L} \frac{V_S^2 - V_R^2 - V_L^2}{2V_R V_L}$$

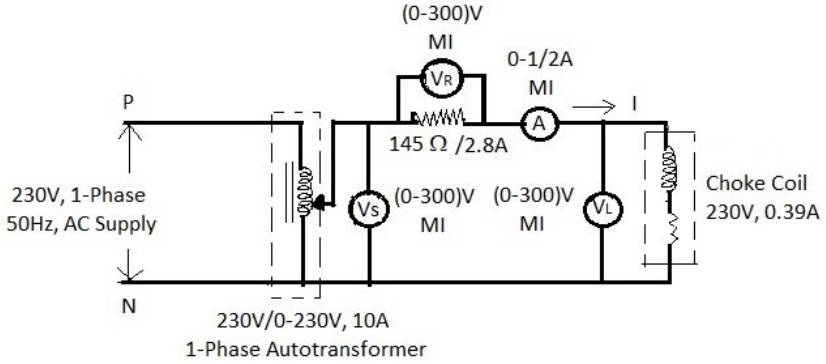
Resistance, $R = \frac{V_L \cos\theta}{I} \frac{V_L \cos\theta}{I}$ **ohms**

Inductive reactance, X_L=

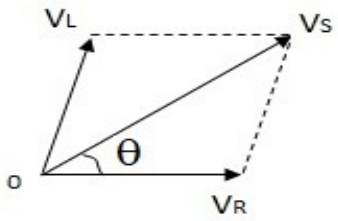
6 Procedure, Program, Activity, Algorithm, Pseudo Code

1. Make the connections as per the circuit diagram.
2. Initially keep the autotransformer in minimum position.
3.Vary the applied voltage by varying the auto-transformer until ratedcurrent flows through the choke coil.
4. Note down the readings of all the meters.

7 Block, Circuit, Model Diagram,

	Reaction Equation, Expected Graph Figure 17...	
8	Observation Table, Look-up Table, Output	

Sl.No	V_S (V)	V_R (V)	V_L (V)	I (A)
1				
2				

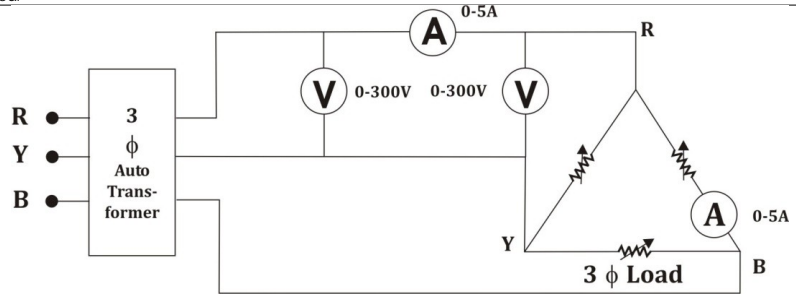
9	Sample Calculations	**Power factor, Cosθ =** $\frac{V_s^2 - V_R^2 - V_L^2}{2V_R V_L}$ **Resistance of the coil, R =** $\frac{V_L \cos\theta}{I}$ **Ω** **Inductive reactance, X_L =** $\frac{V_L \sin\theta}{I}$ **Ω** **Inductance, L = $X_L/2\Pi f$** , Where f is the frequency of supply in Hertz = 50Hz
10	Graphs, Outputs	
11	Results & Analysis	The value of resistance and Inductance of choke coil is determined and tabulated
12	Application Areas	It is used mostly in wall mounted tube lights
13	Remarks	
14	Faculty Signature with Date	

Experiment 04 : DETERMINATION OF PHASE AND LINE QUANTITIES IN THREE PHASE STAR AND DELTA CONNECTION

-	**Experiment No.:**	1	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	DETERMINATION OF PHASE AND LINE QUANTITIES IN THREE PHASE STAR AND DELTA CONNECTION						
2	Course Outcomes							
3	Aim	To determine the phase and line quantities in three phase star and delta Connection.						
4	Material / Equipment Required	Lab Manual						

Sl.no	Particulars	Range	Quantity
1	Voltmeter	MI 0-600V	2Nos
2	Ammeter	MI 0-5A	2 Nos
3	3-φ Auto-transformer	415V/0-440V	1 No
4	Rheostat 50E/5A		3 Nos
5	Connecting wires	--	Few

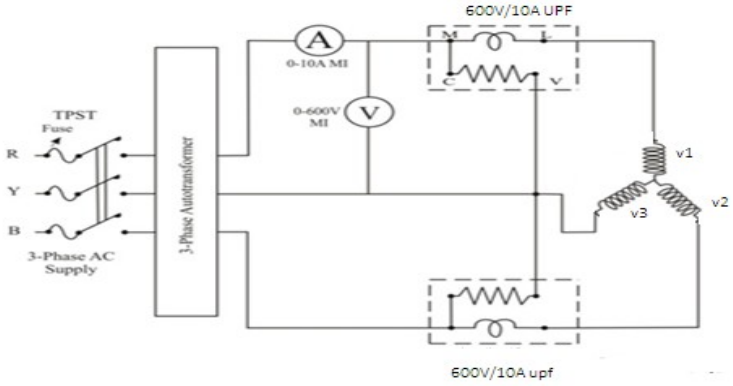
5	Theory, Formula, Principle, Concept	The **star connection** is formed by connecting starting or terminating ends of all the three windings together at a common point. This common point is called neutral point. The remaining three ends are brought out for the supply connection. Star connection is preferred for long distance power transmission because it is having the neutral point. In star connection, the line voltage is √3 times of phase voltage where as the line current are equal to phase current. $V_L = \sqrt{3}V_{ph}$ *and* $I_L = I_{Ph}$ Where Line voltage$(V_L)(V_L)$ is the voltage between two phases in three phase circuit and phase voltage$(V_{ph})(V_{ph})$ is the voltage between one phase to the neutral line.
6	Procedure, Program, Activity, Algorithm, Pseudo Code	1. Connections are made as per the circuit diagram. 2. Keep the position of the auto transformer at zero. 3. Switch ON the supply. 4. Set the rheostat to fixed value. 5. Gradually vary the auto transformer in steps. 6. Then note down the current and voltage readings. 7. Repeat the above procedure for delta connection. 8. Switch off the supply.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	

	Lecture 17	
8	Observation Table, Look-up Table, Output	
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	In star connected load: Line voltages are $\sqrt{3}$ times of phase voltage. Line currents are equal to phase currents. In delta connection load: Line currents are $\sqrt{3}$ times of phase currents Line voltages are equal to phase voltages.
12	Application Areas	Used to connect various loads. Used as starter for 3 phase Induction Motor.
13	Remarks	
14	Faculty Signature with Date	

Sl.No	V_1 in volt (line)	V_{ph} in volt (phase)	I in amps (line)	I in amps (phase)
1				
2				

Experiment 05 : MEASUREMENT OF THREE PHASE POWER USING TWO WATTMETER METHOD

-	**Experiment No.:**	1	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	MEASUREMENT OF THREE PHASE POWER USING TWO WATTMETER METHOD						
2	Course Outcomes	Able to measure 3 phase power.						
3	Aim	Measurement of three phase power by using two wattmeter method during balanced and Unbalanced load condition.						
4	Material / Equipment Required	Lab Manual 3 phase Autotransformer A.C Wattmeter						

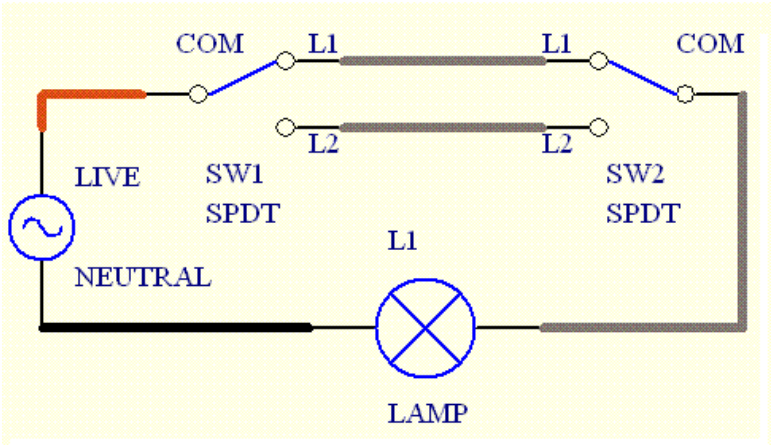
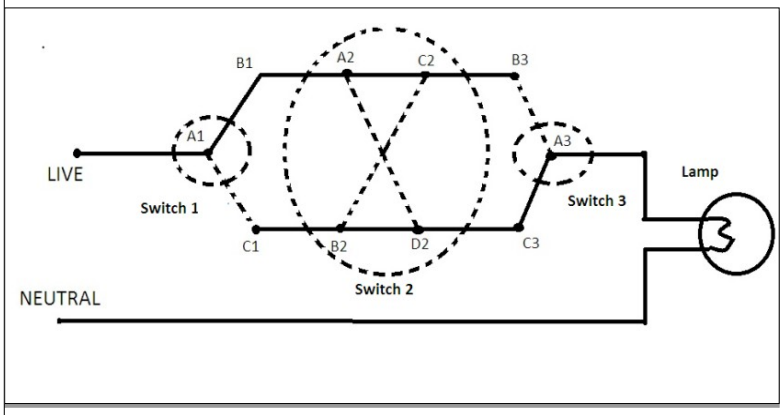
	Lecture 17	A.C Voltmeter A.C ammeter Connecting wires
5	Theory, Formula, Principle, Concept	Wattmeter Constant = k = (Set current x Set Voltage) / Full Scale Deflection
6	Procedure, Program, Activity, Algorithm, Pseudo Code	1. Make the connections as per the circuit diagram 2. Keep the three phase variac(autotransformer) at its zero position 3. Switch on the main supply and gradually increase the input voltage so that all the meters give readble deflection. 4. Note down the readings of all the meters.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	TABULATION:
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	The three-phase power is measured using two wattmeter method and it observed that "Two wattmeter" method is sufficient to measure the three phase power.
12	Application Areas	Used to measure 3 phase power.
13	Remarks	
14	Faculty Signature with Date	

Sl.No	V in Volts	I in Amps	W1x k in Watts	W2 x k in Watts	P=W1+W2 in watts

Experiment 06 : TWO WAY AND THREE WAY CONTROL OF LAMP

-	**Experiment No.:**	1	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	TWO WAY AND THREE WAY CONTROL OF LAMP						
2	Course Outcomes	Able to control a lamp from two and three positions.						

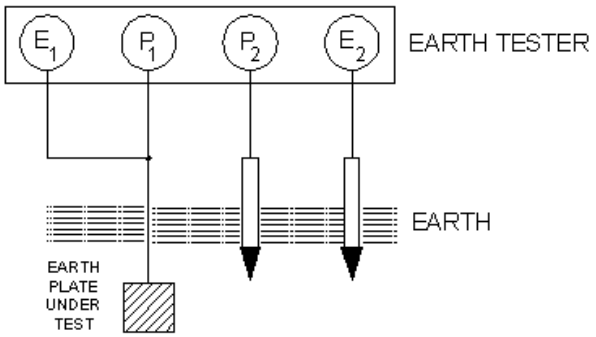
3	Aim	To control one lamp by two 2-way switches and 3-way switches
4	Material / Equipment Required 17..	Lab Manual Kit Kat fuse: 5 Amps. Single pole switch: 5 Amps Lamp holders: 5 Amps Lamps: Round /Square wooden block: Square wooden block: Battens, Nails, Clips, CTS wire, Fuse wire.
5	Theory, Formula, Principle, Concept	The Electrical appliances and equipment like fan and lighting points can controlled by more than one switch. The most commonly used are: **Two Way Control** and **Three Way Control** of electrical appliances. Two way switching connection is used to control electrical appliances at two different places by using 2-way switches. The most common use of 2-way switching connection is staircase wiring where a light point can be controlled from two locations. One switch installed near the first step of the stairs. The other two way switch is installed at the upper part where the stair ends. The light point is provided between first and last stair at an adequate location and height if the lower switch switches ON the light and the other switch at the top can switch it off or Vice versa. The addition of an "intermediate" switch allows a
6	Procedure, Program, Activity, Algorithm, Pseudo Code	**For Two Way Control of lamp** 1. Verify the circuit as per circuit diagram. 2. Switch on the supply. 3. Keep switch SW1 and SW2 in L1 position. 4. Note down the condition of the lamp. 5. Repeat the step 3 for different positions. Note down the condition of the lamp. **For Three Way Control of lamp** 1. Verify the circuit as per circuit diagram. 2. Switch on the supply. 3. Keep switches S1, S2 and S3 in as per the truth table. 4. Note down the condition of the lamp. 5. Repeat the step 3 for different positions. Note down the condition of the lamp.

7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph Circuit 17...	 
8	Observation Table, Look-up Table, Output	for two way control: Switch position / Lamp condition SW1 / SW2 L1 / L1 / ON L1 / L2 / OFF L2 / L1 / OFF L2 / L2 / ON TABULATION FOR 3-WAY CONTROL: Sl. No / Switch S1 A1 connected to / Switch S2 A2 Connected to / Switch S2 B2 Connected to / Switch S3 A3 connected to / Lamp Condition 1 / B1 / C2 / D2 / C3 / OFF 2 / C1 / C2 / D2 / C3 / ON 3 / C1 / D2 / C2 / C3 / OFF 4 / C1 / D2 / C2 / B3 / ON
9	Sample	

	Calculations	
10	Graphs, Outputs	
11	Results & Analysis	Truth table of two way and three way control of lamps are formed and verified.
12	Application Areas	Used in domestic and Industry wiring system.
13	Remarks	
14	Faculty Signature with Date	

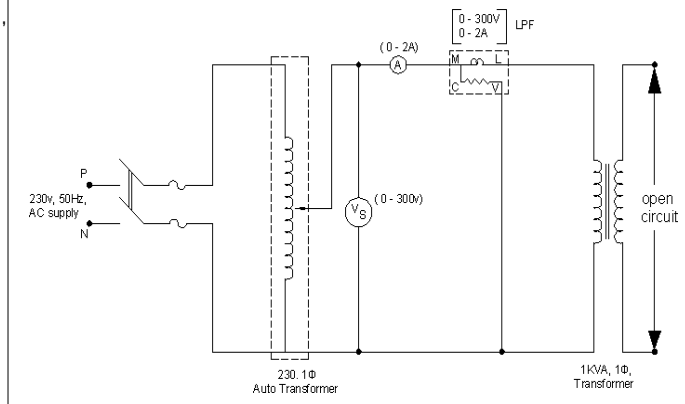
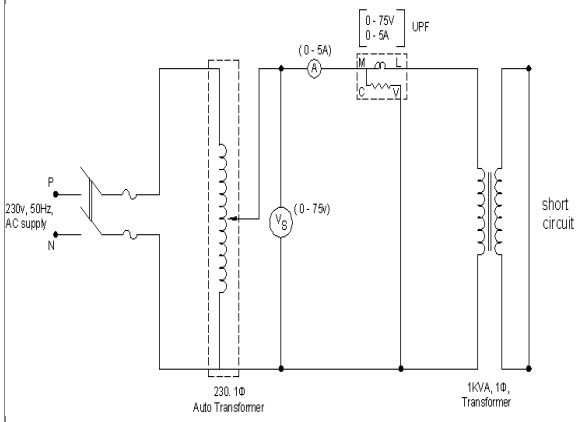
Experiment 07 : MEASUREMENT OF EARTH RESISTANCE

-	**Experiment No.:**	1	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	MEASUREMENT OF EARTH RESISTANCE						
2	Course Outcomes	Able to find earth resistance.						
3	Aim	To measure the resistance of the earth.						
4	Material / Equipment Required	Lab Manual Earth tester (Megger) – 1 Connecting wires – 5m Measuring Tape – 1						
5	Theory, Formula, Principle, Concept	The resistance offered by the earth electrode to the flow of current into the ground is known as the earth resistance or resistance to earth. The earth resistance mainly implies the resistance between the electrode and the point of zero potential. Ideally, the ground resistance should be of zero ohms but there is no standard ground resistance threshold or value that is being followed. However, a ground resistance value of 5.0 ohm or less is recommended by IEEE. The grounding resistance is determined with this earth tester in three measuring ranges up to 2000 Ω using three-wire technology. The Earth Tester or Megger is a handheld instrument used to quickly and easily determine earth and ground resistance.						
6	Procedure, Program, Activity, Algorithm, Pseudo Code	1. Connect C1 and P1 terminals on the test set to the earth electrode as shown in circuit diagram. 2. Connect the terminal C2 to an electrode Z kept at 5m away from main electrode X and buried to a depth of 6 – 12 inches. 3. Connect the terminal P2 to an electrode Y which is kept midway between X & Z and buried to a depth of 6 – 12 inches. 4. Rotate the megger handle and record the resistance measurement. 5 .Note down the readings of measured resistance by changing the distance between electrodes.						

7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	
8	Observation Table, Look-up Table, Output	Sl No | Distance in mtr | Resistance in Ω 1 2 3
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	The average value of the earth resistance is _____ Ω.
12	Application Areas	Used to measure earth resistance.
13	Remarks	
14	Faculty Signature with Date	

Experiment 08 : STUDY OF EFFECT OF OPEN AND SHORT CIRCUITS IN SIMPLE CIRCUITS

-	**Experiment No.:**	1	**Marks**		**Date Planned**		**Date Conducted**	
1	Title	STUDY OF EFFECT OF OPEN AND SHORT CIRCUITS IN SIMPLE CIRCUITS						
2	Course Outcomes	Able to know the effect of Open and Short circuit in AC circuits.						
3	Aim							
4	Material / Equipment Required	Lab Manual Voltmeter - 1 no. Ammeter - 1 no 30V DC Power Supply - 1 no Connecting wires						
5	Theory, Formula, Principle, Concept	An open circuit is a circuit where no current flows. The circuit which does not have a return path is an open circuit. Hence there is infinite impedance between two nodes therefore current becomes zero. A short circuit is an electrical circuit that allows a current to travel along a low electrical impedance path. This results in an excessive amount of current flowing into the circuit.						
6	Procedure, Program, Activity, Algorithm, Pseudo	1) Make the connections as per the circuit diagram and make sure that autotransformer is at zero position.						

	Code Picture 17...	2) Switch ON the supply. Now apply the rated voltage to the Primary winding by using variac. 3) The readings of the Voltmeter, ammeter and wattmeter are noted down in Tabular form. 4) Bring back the autotransformer to zero position and switch off the supply.
7	Block, Circuit, Model Diagram, Reaction Equation, Expected Graph	 
8	Observation Table, Look-up Table, Output	Sl.No. | V_{sc} Volts | I_{sc} Amps 1 | |
9	Sample Calculations	
10	Graphs, Outputs	
11	Results & Analysis	It is observed that After open circuit, the voltage increases across the load but current becomes Zero. After short circuit, the current increase but voltage becomes Zero.
12	Application Areas	Used to obtain transformer losses.
13	Remarks	
14	Faculty Signature	

	with Date	

Figure 17...