Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title:	**ELECTRICAL WIRING LAB**	Course Code	: **15EE12P**
Semester	: **I**	Course Group	: **Core**
Teaching Scheme in Hrs (L:T:P)	: **0:2:4**	Credits	: **3 Credits**
Type of course	: **Tutorial + Practical**	Total Contact Hours	: **78**
CIE	: **25 Marks**	SEE	: **50 Marks**

Pre-requisites	: Knowledge of modern science in secondary education.
Course Objectives	: To develop electrical wiring skills in students through systematic training that would enable the students to construct and test various electrical circuits using appropriate electrician tools, wires, protective devices and wiring accessories as per IS standards.

Course Outcome:

On successful completion of the Course the student will be able to:

1. Use appropriate electrician tools, wires, protective devices and wiring accessories.
2. Rig up wiring diagrams using conduit system of wiring.
3. Apply IS standards for electrical wiring.
4. Prepare different types of wiring joints.

Course Content:

TUTORIAL

Sl. No	Topic	Hours
1.	**Safety precautions and first aid** Draw standard electrical symbols related to electrical wiring. Understand the components of simple electrical circuit consisting of source , load , protective devices and measuring instruments. Identify open, close and short circuit.	6
2	**Identify different types of electrician tools** Combination plier, Cutting Plier, Nose plier, screw driver set, line tester , Poker, Hand Drill, Power Drill, Concrete Drill, Megger, Earth tester, Continuity tester, crimping tool, wire cutter , Wire splicer, wire stripper standard wire gauge, , soldering iron, wooden mallet ,ball pin hammer, testing board and multimeter. **Identify different types of wiring systems and their applications** Surface conduit , concealed conduit, PVC casing capping Types of wires, cables used for different current and voltage ratings	6
3	**Identify different wiring accessories and hardware items**	6

	SP, DP, ICDP, ICTP, change over switch, SPST, DPST,DPDT, TPST,TPDT, rotary switches , micro switches, modular switches, 2 pin socket ,3 pin socket, 2 pin plug top , 3 pin plug top, ceiling rose, round block, switch boards, switch plates, modular switch enclosures, blank insert gang box , junction box, fan box, saddles ,screws	
4	**Identify various safety devices** Types of fuse units and Materials for fuse wire, Glass cartridge fuse, types of HRC fuse, Kit kat fuse. Types of MCB, MCCB, RCCB, ELCB Types of Earthing- Pipe earthing , Plate earthing and Chemical earthing	3
	Total	**21**

CONDUCTING EXPERIMENTS

	List of graded exercises	Hours
1	Prepare the following joints . Straight joint , Tee joint, Britannia joint, Western union joint	09
2	Rig up a circuit to control three lamps in (a) series and (b) parallel using one SP switch.	03
3	Rig up a circuit to control one lamp from one place and test the wiring for phase control.	03
4	Rig up a circuit to control two lamps from two places independently	03
5	Rig up a circuit to control one lamp and a socket independently	03
6	Rig up a circuit to control one lamp from two place using two way switches (staircase wiring)	03
7	Rig up a circuit to control a fan using electronic regulator.	03
8	Wire up a fluorescent tube fitting, connect and test it.	03
9	Rig up a calling bell circuit with indicator to be operated from three different places using push button switches.	03
10	Connect a rotary switch to a two element heater to get low, medium and high effects.	03
11	Prepare a meter board for lighting installation using energy meter, fuse, MCB, DP switch ELCB and indicator	06
12	Connect different domestic appliances and measure the current drawn by them using tong tester.	06
13	Test the lighting installation for open circuit, short circuit, polarity, insulation resistance and earth fault.	09
	Total hours	**78**

Note:

1. All exercises to be done using surface conduit system
2. PVC casing capping may be demonstrated for any one of the exercises.

Resources:

1. Electrical trade practical's – NIMI
2. Electrical workshop practice – ANWANI.
3. Guidelines for Electrical wiring in residential buildings -www.st.gov.my/
4. General specifications for electrical works- www.cpwd.gov.in/
5. Code of practice for electrical wiring installations- www.law.resource.org
6. Electric supply and distribution code – www.kptcl.com

Composition of Educational Components:

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No.	Educational Component	Weightage (%)
1	Remembering	20
2	Understanding	20
3	Application/ Analysis	60
Total		**100**

Mapping Course Outcomes with Program Outcomes: (Course Outcome linkage to Cognitive Level)

Course Outcome		Experiment linked	PO Mapped	Cognitive Level	Lab Sessions
CO1	Use appropriate electrician tools, wires, protective devices and wiring accessories.	Tutorial 1, 2, 3, 4	2, 3, 8, 9, 10	R/U/A	21
CO2	Rig up wiring diagrams using conduit system of wiring.	2 to 13	2, 3, 8, 9, 10	U/A	58
CO3	Apply IS standards for electrical wiring.	2 to 13	2, 3, 8, 9, 10	U/A	58
CO4	Prepare different types of wiring joints.	1	2, 3, 8, 9, 10	U/A	9

U-Understanding; A-application/ Analysis; App-Application

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Electrical Wiring Lab	-	**3**	**3**	-	-	-	-	**3**	**3**	**3**

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

Course Delivery:

The laboratory Course will be delivered through Tutorial, laboratory interaction, group discussion, practical exercises, instructions, assignments and viva voice.

Tutorial - 1Hr:

Staff-in-charge will;

1. Explain the concept and working of experiment to be conducted.
2. Impart/ discuss required selection of fuses, switches, devices/ meters /equipment / suitable accessories for the experiment to be conducted.
3. Ask students to draw the circuit diagram/ wiring diagram, tabular column and truth table if any.
4. Give clear instructions about safety precautions to be followed while conducting the experiment.

Conduction/ Execution- 2 Hr:

Student will rig up the circuit diagram and conduct experiment individually under the supervision of the staff-in-charge.

Course Assessment and Evaluation:

	What		To Whom	Frequency	Practical Marks	Evidence Collected	Course Outcomes
Direct Assessment	CIE (Continuous Internal Evaluation)	I A Tests	Students	Two IA tests for Practical (Average marks of both the tests are considered)	10	Blue Books	1 to 4
		Classroom Assignments		Mini project	05	Models	1 to 4
		Record Writing		Record Writing (Average of Marks allotted for each expt.)	10	Record Book	1 to 4
				TOTAL	25		
	SEE (Semester End Examination)	End Exam	Students	End Of the Course	50	Answer Scripts at BTE	ALL COs
Indirect Assessment	Student Feedback on course		Students	Middle Of The Course	Feed Back Forms		1 – 4
	End Of Course Survey			End Of The Course	Questionnaire		All COs

*__CIE__ – Continuous Internal Evaluation *__SEE__ – Semester End Examination

Note:

1. I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.
2. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

Suggested Student Activity:

Mini-Projects: Like preparing extension box, switch box and wiring models, simple panel board, and distribution board, building wiring of a lab/ room, etc.

MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY (Course Coordinator)

Dimension	Scale					Students score (Group of five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	3				
2	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2				
3	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	5				
4	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	4				
Note: Concerned faculty (Course coordinator) must devise appropriate rubrics/criteria for assessing Student activity for 5 marks **One activity on any one CO (course outcome) may be given to a group of FIVE students** **Grand Average/Total**						14/4 =3.5 ≈4				

Example only: MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY-
Task given- Industrial visit and report writing

Dimension	Scale					Students score (Five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1.Organisation	Has not included relevant info	Has included few relevant info	Has included some relevant info	Has included many relevant info	Has included all relevant info needed	3				
2. Fulfill team's roles & duties	Does not perform any duties assigned	Performs very little duties	Performs partial duties	Performs nearly all duties	Performs all duties of assigned team roles	2				
3.Conclusion	Poor	Less Effective	Partially effective	Summarises but not exact.	Most Effective	5				
4.Conversions	Frequent Error	More Error	Some Error	Occasional Error	No Error	4				
					Total marks	14/4=3.5 ≈4				

Scheme of Valuation:

Sl. no.	Performance	Max. Marks
1	Identify the electrician tools and components	**05**
2	Prepare the given type of Joint	**05**
3	Draw wiring diagram and write procedure (Only One Question to be given)	**10**
4.	Conduction	**15**
5	Result	**05**
6	Viva	**10**
	Total	**50**

Model Questions:

1. Identify the tools and components.
2. Prepare a straight joint.
3. Rig up a circuit to control three lamps in (a) series and (b) parallel using one SPS.
4. Rig up a circuit to control one lamp from one place.
5. Rig up a circuit to control two lamps from two places independently
6. Rig up a circuit to control one lamp and a socket independently
7. Rig up a circuit to control one lamp from two place using two way switches
8. Rig up a circuit to control one lamp from three places using intermediate switch.
9. Rig up a circuit to control a fan using electronic regulator.
10. Wire up a fluorescent tube fitting, connect and test it.
11. Rig up a calling bell circuit with indicator to be operated from three different places.
12. Connect a rotary switch to a two element heater to get low, medium and high effects.

List of Equipment:

(For a batch of 20 students)

Sl.no	Name of equipment	Qty
1	Wooden board 2'x 3'	20 Nos.
2	Electrician Tools	
	Screw driver 8",10",12"	10 Nos
	Combination plier 6",8"	10 Nos
	Neon tester	10 Nos
	Round nose plier 15cm	10 Nos
	Electrician knife 10cm	10 Nos
	Heavy duty screw driver 10",12"	10 Nos
	Nose fliers 6"	10 Nos
	B.P Hammer 1/2kg.1/4kg	10 Nos
	Cold chisel 15cm	10 Nos
	Tri square 15cm	10 Nos
	Former chisel 14cm,20cm,25cm	10 Nos
	Poker 15cm	10 Nos
	Hacksaw 30cm	10 Nos
	Hand drilling machine 6mm	02 Nos.
	Wire stripper 10cm	10 Nos
	Measuring tapes 5meter	02 Nos.
	Standard wire gauge.	02 Nos.
3	Wiring accessories	
	a) PVC conduit 1/2",3/4",1"	10 lengths each
	b) Saddles of assorted sizes	20 dozens
	c) Different Switches 5A, 230v	50 Nos.
	d) Different Sockets 5A, 230v	50 Nos.
	e) Different Holders 5A, 230v	50 Nos.
	f) Ceiling Roses	50 Nos.
	g) Wooden / PVC round blocks	50 Nos.
	h) Wires of different sq. mm 1.5sq.mm,2.5sq.mm,	50 Nos
	i) Different Gang boxes	50 Nos.
	j) Kit –Kat fuses5A, 230v	50 Nos.
	k) Screws of assorted sizes	200 Nos
	l) 7/18, 7/16 SWG Alu conductor PVC cable(for joints)	02 coils
	m) Fluorescent lamp fitting	10 Nos.
	n) Rotary switch	10 Nos.
	o) 1.5sqmm copper wire	04 coils
	p) Electronic regulator	05 Nos.
	q) Buzzer	05 Nos
4	Megger 500V	05 Nos.
5	Earth tester	02 Nos.
6	Tong tester	02 Nos.
6	AVO meters / multimeter	05 Nos.
7	Single phase energy meter 10 A 230 volts- analog type	05 Nos.
8	ELCB , 16 A single phase and three phase	02 Nos. each
9	16A , 32 A , 230 v different DP switches	05 Nos. each