Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	Electrical & Electronics Engineering	**Semester**	**I / II**
Course Name	Fundamentals of Electrical and Electronics Engineering	**Type of Course**	Integrated
Course Code	**25EE01I**	**Contact Hours**	7 hours/week 91 hours/semester
Teaching Scheme	3:0:4	**Credits**	5
CIE Marks	**50**	**SEE Marks**	**50 (Practice)**

1. Rationale:

Fundamentals of Electrical and Electronics Engineering is essential for all streams of diploma engineering.
At the end of this Course the student is able to gain knowledge about electrical safety, DC and AC circuits,
Electrical wiring circuits, protective devices, electrical machines, and working of electronics devices

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Comply with the Electrical safety procedures
CO-02	Analyze simple electrical circuits and Wire up simple demotic electrical wiring systems with proper protective device
CO-03	Identify different types of electrical machines and interpret Name plate details of given electrical machines
CO-04	Test and report condition of given Battery and connect UPS to AC Mains.
CO-05	Identify and select the Electronic components for given application

3. Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,4	**Electrical safety Procedures:** ● Meaning of Electrical Safety ● Safety precautions in electrical working place ● Electrocution (Electric shock) and How to free a person from electrocution.	● Demonstrate use of Personal Protective Equipment (PPE) and types ● Electrocution (Electric shock) Use Videos to demonstrate how to free a person from electrocution
	1	1,4	First aid in Electrical injury and methods Electrical fire, causes and preventions Fire extinguishers and types	Demonstration of Pipe and plate Earthing methods Know your Electrical lab. Identify power supply, various components with symbols, Check earthing by measuring the voltage between neutral and earth points.
	1	1,4	● Types of Electrician Tools and their functions ● Earthing Definition, necessity and types Advantages of Earthing	
2	2	1,4	**Sources of Electricity** ● Sources of Electricity- Conventional and Non-conventional sources ● Advantages of electrical energy ● Effects of electric current and its applications	Video demonstration on identification and observation of different ranges and types of meters Verification of Ohm's Law using simple circuit
	2	1,4	**Definition, units and meters;** Electric Current, Voltage, Resistance, Potential Difference, EMF **Ohm's Law;** ● Statement, explanation, Applications and limitations.	Demonstrate experimentally Open circuit, closed circuit and short circuit conditions in Simple series circuit.
	2	1,4	**Circuit conditions**- ● open, close, and short circuit	
3	2	1,4	Features of Series and Parallel circuits	Determine the equivalent Resistance in series resistive circuit
	2	1,4	Simple problems on Series circuit	
	2	1,4	Simple problems Parallel circuit.	Determine the equivalent Resistance in parallel resistive circuit

4	2	1,4	**Definitions, units and meters;** ● Electrical work, power and energy, ● Simple problems on Electrical energy consumption (Unit/ KWh)	1. Measure the AC voltage, current, power , using relevant measuring instruments in a Single phase AC circuit 2. Measurement of energy in a Single phase AC circuit
	2	1,4	**AC Fundamentals** ● Sinusoidal voltage,current, ● definitions of amplitude, cycle, time-period, frequency	Demonstrate the measurement of Amplitude, peak-peak value, time period and frequency of AC quantity using CRO and function generator.
	2	1,4	● Single phase and Three phase electrical power supplies ● Applications of single-phase and three-phase power ● Merits of three phase system over single phase system.	
5	2	1,4	**Protective Devices** ● Meaning ● Necessity of protective devices ● Functions and Applications of ✓ Rewireable Fuse ✓ Glass cartridge fuse ✓ HRC fuse	Wire up and test PVC Conduit wiring to control two lamps and one socket independently by providing suitable protective devices.
	2	1,4	✓ Kit-kat fuse ✓ MCB ✓ ELCB	Wire up and test to control one lamp from two places using suitable protective devices (Two- way control/ Staircase wiring)
	2 2	1,4	● Types of wiring systems and accessories	
6	3	1,4	**Electromagnetic Induction:** ● Definition, Faraday's laws, Statically and dynamically induced EMF generation. ● Self and mutual induced EMF.	Control a lamp using Electromagnetic Relay

	3 3	1,4	**Transformers:** ● Function, working, video demonstration on construction of transformer	Determine experimentally the transformation ratio of a given Transformer
	3	1,4	● Classification and applications, Transformation ratio.	
7	3	1,4	**Generators**: ● DC and AC Generators- definition, types and applications	Study the Name plate details of a given Electrical machine
	3	1,4	**DC Motors:** ● Definition, types and applications. ● BLDC motor applications	Video demonstration of construction of three phase Induction Motor.
	3	1,4	**AC Motors:** ● Definition ,Types & Applications ● Necessity of starters for AC motors. ● Types and applications.	Wire up a starter to start and reverse the 1 Phase/3 phase AC motor.
8	4	1,4	**Cells and Batteries:** ● Definition, symbol, types, comparison and applications	Construct a simple battery using primary cells for the required voltage and to light an LED through a resistor in series.
	4	1,4	● Lead Acid battery and its maintenance	Video demonstration on construction of Lithium-Ion battery
	4	1,4	● Lithium-Ion battery and its applications	
9	4	1,4	● Ampere-Hour Capacity, Selection criteria of batteries	Test and report the condition of given Lead Acid battery /Lithium-Ion battery
	4	1,4	**UPS** ● Meaning, types and applications	
	4	1,4	● Block diagram of online UPS system.	Connect UPS in an electrical lighting system and observe continuity of supply. Measure the AC voltage.
10	4	1,4	● Introduction of Alternate Energy Sources and Applications	Video Demonstration on working of a Simple Electric Vehicle
	4	1,4	● Evolution of Electric Vehicles, Batteries used for EVs	
	4	1,4	● Electric Motors used in EVs ● Battery and UPS ratings for Solar powered Street lighting	Video demonstration on solar powered street lighting

11	5	1,4	**Electronic Components** ● Resistors, Capacitors and Inductors - Definition, Unit, Types, and Applications.	Identify and determine the value of resistance, inductance and capacitance using LCR meter Compute the value of a given carbon resistor using colour coding.
	5	1,4	● Definitions of conductors, insulators and semiconductors with examples ● comparison and applications	Identify the terminals of Diode. Connect the diode in forward and reverse bias modes and observe the status of the LED connected in the circuit.
	5	1,4	**Semiconductor Diode;** ● Definitions of P and N type semiconductors, ● Diode and its Symbol ● Working of Diode in forward and reverse bias ● Types of diodes and ratings ● Applications	
12	5	1,4	**Rectifier** • Definition, types, working of Bridge rectifier	Trace the input and output waveforms of an IC Bridge rectifier.
	5	1,4	**Transistor** ● Definition and Types ● Symbol ● Applications	
	5	1,4	**Digital fundamentals** ● Integrated Circuits (IC) - Definition, advantages and applications ● Logic Gates- Symbol, Boolean expression and truth table of AND, OR, NOT, NAND,NOR, EX- OR gates	Verify the truth tables of AND, OR, NOT, NAND, NOR, EX-OR gates
13	5	1,4	**Sensors and Actuators;** ● Definition, Types and Applications of sensors	1. Construct Photo-diode circuit and Test for its working 2. Detect an object using IR proximity sensor
	5	1,4	● LDR, Photodiode, and Photo transistor (opto-isolator), Solar cell- Symbol and Applications	
	5	1,4	● Definition of Actuator, Types and applications. ● PLC- Block diagram and PLC applications.	Video demonstration on working of any simple Mechanical/ Electrical Actuator. List commercially available PLCs.

4.References:

1. ABC of Electrical Engineering by B. L. Theraja and A. K. Theraja, S Chand Pu
2. Basic Electrical and Electronics Engineering by S. K. Bhattacharya, Pearson Education India, 2012 Edition
3. Electronic Devices and Circuits by I. J. Nagrath, PHI Learning Pvt. Ltd., 2007 Edition.
4. Basic Electrical Engineering byV. Mittle and ArvindMittle, McGrawHill Companies, 2005 Edition
5. The 8051 Microcontroller & Embedded systemsusinkbnnnjbbh bb vvvvg assembly and C (2ndEdition)–M.A.Mazidi , J.C. Mazidi&R.D.McKinlay ISBN: 81-317-1026-2

6. Programmable Logic controllers, W BOLTON
7. https://www.youtube.com/watch?v=mc979OhitAg&list=PLWv9VM947MKi 7yJ0 FCfzTBXpQUQd3K
8. https://www.youtube.com/watch?v=CWulQ1ZSE3c
9. en.wikipedia.org/wiki/Transformer
10. http://www.animations.physics.unsw.edu.au//jw/AC.html
11. http://www.alpharubicon.com/altenergy/understandingAC.htm
12. http://www.electronics-tutorials/
13. http://www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf
14. http://www.technologystudent.com/elec1/transis1.htm
15. http://www.learningaboutelectronics.com/
16. http://www.electrical4u.com/
17. https://www.youtube.com/watch?v=zLW
18. https://www.youtube.com/watch?v=8PTNjw-hQIM

5. CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2 Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4 Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	**50 Marks**

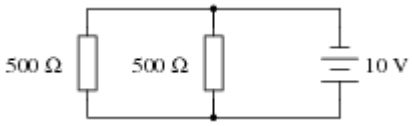
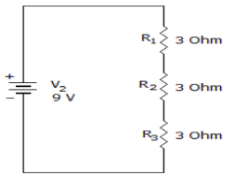
6. SEE – Practice Assessment Methodologies

Sl.No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper

Program	Electrical & Electronics Engineering			**Semester -I/II**	
Course Name	Fundamentals of Electrical and Electronics Engineering			**Test**	**I/III**
Course Code	**25EE01I**	**Duration**	**90 min**	**Marks**	**50**
Name of the Course Coordinator:					

Note: Answer any one full question from each section. Each full question carries equal marks.

Q.No	Questions	Cognitive Level	Course Outcome	Marks
	Section - 1			
1	a) List any 5 electrician tools. Mention their function. b)State and explain Ohm's Law. List the limitations of Ohm's Law. c)Compare single-phase and three-phase power. d)Calculate the total current drawn by the below circuit. 	1 2 3 4	1 2 2 2	5 8 6 6
2	a)Define earthing. List the different types of earthing. b)With simple diagrams explain open circuit, short circuit and closed circuit c)What are the Advantages of three phase power over single phase power. d) Find the equivalent resistance and the current flowing through 3-ohm resistance in the circuit below. 	1 2 3 4	1 2 2 2	5 8 6 6
	Section - 2			
3	a)List any 5 sources of electrical energy b) Draw a sinusoidal waveform and name amplitude, instantaneous value, time period, frequency and cycle. c)How to free a person from electrocution? d)An electric fan draws a current of 0.9 Amps when connected to a single-phase, 230 volts, 50 HZ AC supply through an electric regulator. Determine the resistance of the regulator.	1 2 3 4	1 2 2 2	5 8 6 6

4	a)List the safety precautions to be taken in an electrical working place b)Define Current, Voltage and Resistance. Mention their symbol and Units. c)List the different types of fire extinguishers. Which type of fire extinguisher do you use to extinguish fire caused by wood and cooking oil? d)A 9 Volt cell when used in an electrical circuit turns on a LED. State the effect of electric current. Justify	1 2 3 4	1 2 2 2	5 8 6 6
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator **Signature of the HOD** **Signature of the IQAC Chairman**

8. CIE Practice Test model question paper

Program	Electrical & Electronics Engineering			**Semester**	**I/II**
Course Name	Fundamentals of Electrical and Electronics Engineering			**Test**	**II/IV**
Course Code	**25EE01I**	**Duration**	**180 min**	**Marks**	**50**
Name of the Course Coordinator:					

Questions	**CO**	**Marks**
NOTE : Any ONE of the following questions may be allotted to each student		**50**
1. Verify Ohm's Law using a simple circuit.	**1**	
2. Demonstrate experimentally Open circuit, closed circuit and short circuit conditions in Simple series circuit.	**2**	
3. Determine the equivalent Resistance in series circuit	**2**	
4. Determine the equivalent Resistance in parallel circuit		
5. Measure the AC voltage, current, power using relevant measuring instruments in a Single phase AC circuit	**2**	
6. Measurement of energy in a Single phase AC circuit	**2**	
7. Measure Amplitude, peak-peak value, time period and frequency of AC quantity using CRO and function generator.	**2**	
8. Wire up and test PVC Conduit wiring to control two lamps and one socket independently by providing suitable protective devices.	**2**	
9. Wire up and test to control one lamp from two places using suitable		
10. protective devices (Two- way control/ Staircase wiring)	**2**	
11. Wire up Panel board wiring with protective devices (fuse, MCB, load, Neutral link)		
12. Control a lamp using Electromagnetic Relay	**2**	
13. Demonstrate the concept of Electromagnetic induction using coil, magnet and galvanometer	**2** **3**	
14. Determine experimentally the transformation ratio of a given Transformer	**3**	
15. Wire up a starter to start and reverse the 1 Phase/3 phase AC motor.	**3**	

Scheme of assessment	
a) Identification of meters/ equipment/wires/tools etc	**5**
b) Writing Circuit/writing diagram and Procedure	**12**
c) Conduction	**18**
d) Results	**5**
e) Viva-voce	**10**
Total Marks	**50**

Signature of the Course Coordinator
Signature of the HOD

9. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose **any two** activities that are relevant to the topic

Sl.No.	Suggestive Activities
01	Given the practical working circuits, measure Resistance, Current, Voltage, Power and Energy in DC and AC (Single phase) Circuits Using suitable meters/ instruments.
02	List out the different types of wiring systems used in your laboratories or house with their representation
03	Mini-Projects: Like preparing extension box, switch box and wiring models
04	List out the different protective devices used in your laboratories or house with their ratings.
05	Applications of Electromagnetic Induction, statically induced and dynamically induced emf, self and mutual induced emfs
06	Prepare a report on types of starters and enclosures used for various industrial applications of AC motors.
07	Types of Cells and Battery maintenance
08	Visit a nearby Battery charging shop or showroom and prepare a report of the visit.
09	Prepare a report on various types of diodes used for various industrial applications.
10	Prepare a report on various types of sensors and actuators used for various industrial applications.
11	Mini-Projects: Connect and test a sensor (domain application) to a Digital circuit
12	Prepare a report stating HP rating, types and applications of FHP motors.

10. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Student Score
		2	4	6	8	10	
1		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
2		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
3		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
4		Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2
	Average Marks=(8+6+2+2)/4=4.5						**5**

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

11. SEE- Model Practice Question Paper

Program	Electrical & Electronics Engineering		**Semester**	**I/II**
Course Name	Fundamentals of Electrical and Electronics Engineering	**Course Code 25EE01I**	**Duration**	**180 min**
Questions			**CO**	**Marks**
NOTE : Any ONE of the following questions may be allotted to each student				**50**
1. Verify Ohm's Law using a simple circuit.			**1**	
2. Demonstrate experimentally Open circuit, closed circuit and short circuit conditions in Simple series circuit.			**2**	
3. Determine the equivalent Resistance in series circuit			**2**	
4. Determine the equivalent Resistance in parallel circuit			**2**	
5. Measure the AC voltage, current, power using relevant measuring instruments in a Single phase AC circuit			**2**	
6. Measurement of energy in a Single phase AC circuit			**2**	
7. Measure Amplitude, peak-peak value, time period and frequency of AC quantity using CRO and function generator.			**2**	
8. Wire up and test PVC Conduit wiring to control two lamps and one socket independently by providing suitable protective devices.			**2**	
9. Wire up and test to control one lamp from two places using suitable				
10. protective devices (Two- way control/ Staircase wiring)			**2**	
11. Wire up Panel board wiring with protective devices (fuse, MCB, load, Neutral link)			**2**	
12. Control a lamp using Electromagnetic Relay				
13. Demonstrate the concept of Electromagnetic induction using coil, magnet and galvanometer			**2**	
14. Determine experimentally the transformation ratio of a given Transformer			**3**	
15. Wire up a starter to start and reverse the 1 Phase/3 phase AC motor.			**3**	
16. Construct a simple battery using primary cells for the required voltage and to lit an LED through a resistor in series.			**3**	
17. Identify and determine the value of resistance, inductance and capacitance using digital multi meter/LCR meter			**4** **5**	
18. Compute the value of a given carbon resistor using colour coding.			**5**	
19. Connect the diode in forward and reverse bias modes and observe the status of LED connected in the circuit.			**5** **5**	
20. Trace the input and output waveforms of an IC Bridge rectifier.			**5**	
21. Verify the truth tables of AND, OR, NOT, NAND, NOR, EX-OR gates (ANY 3)			**5**	
22. Construct Photo-diode circuit and Test for its working				
23. Detect an object using IR proximity sensor				
Scheme of assessment				
a) Identification of meters/ equipment/wires/tools etc				**5**
b) Writing Circuit/writing diagram and Procedure				**12**
c) Conduction				**18**
d) Results				**5**
e) Viva-voce				**10**
			Total Marks	**50**

1) Signature of the Examiner **2) Signature of the Examiner**

12. Equipment/software list with Specification for a batch of 30 students

	Particulars	Specification	Quanti ty
01	Dual Channel ,continuously variable DC Regulated Power Supply with Current and Overload Protection	30 V, 2 A	05
02	Fixed DC Regulated Power Supply	+/- 15 V, 2 A	05
03	Portable Moving Coil DC Voltmeters	a) 0 - 1 V b) 0 - 10 V c) 0 - 30 V	Each 05 No.
04	Portable Moving Iron AC Voltmeters	a) 0 - 300 V b) b) 0 - 600 V	Each 05 No.
05	Portable Moving Coil DC Ammeters	a) 0 - 100 mA b) 0 - 1 A c) 0 - 2 A	Each 05 No.
06	Portable Moving Iron AC Ammeters	a) 0 - 2 A b) 0 - 5 A c) 0 - 10 A	Each 05 No.
07	Watt-meters	a) 150/ 300V, 2 A, UPF b) 300/ 600 V, 5/ 10 A, LPF	Each 02 No.
08	Rheostats	25 Ohms, 50 Ohms, 150 Ohms, 220 Ohms (all rated at 3 A)	Each 05 No.
09	Rheostat Loads	1 KW, 230 V	02
10	Wire wound Resistors	-5 Ohms 2 Watts, 25 Ohms 5 Watts, 330 Ohms 2 Watts, 560 Ohms 2 Watts, etc.	Each 05 No.
11	Soldering Iron	60 W	05
12	Single Phase Energy meter	10 A, 230 V, 50 Hz, Digital type	05
13	Multimeter Digital	¾”	06
14	Dual Trace Oscilloscope	30 MHz	02
15	Three Phase Induction Motor	1 HP – 440 V 50 Hz, 2 HP – 440 V 50 Hz.	Each 02 No.
16	Three phase DOL, Star-Delta, Auto transformer starter		Each 02 No.
17	UPS	1 KVA	01
18	Battery and Hydrometers	Battery Lead-Acid type, 140 A-hr	02
19	I C Trainer kit		05
20	Digital IC’s	7400, 7402, 7404, 7408, 7486 etc	Each 10 No
21	Wooden Wiring board	(2x3) ft	10

22	**Wiring accessories** a) PVC conduit - ¾" - 10 lengths b) Cap and casing - ¾" - 10 lengths c) Switches Single Pole- 5A, 230 V d) Switches two way – 5 A, 230 V e) 3 Pin Sockets 5A, 230 V f) Bulb Holders – 5 A, 230 V g) 3 Pin Plug 5A, 230 V h) 60 Watts Lamps i) 100 Watts Lamps j) 15 W CFL lamps k) Copper Wires of sizes 1.5 mm2, 2.5 mm2, 4 mm2 – 1 coil each l) Gang boxes (1+1, 2+1, 2+2) m) Kit –Kat fuses 5A, 15 A n) MCB 16 A & 32 A/ 230 V, Single and Double Pole o) ELCB 16 A & 32 A/ 230 V, Double Pole p) Neutral link- 16 A, 230 V q) Screws of assorted sizes r) Testers		Each 10 No
22	**Electronic Components** a) Diodes - BY 127 and IN 4001 b) Zener Diodes – 6.2 V, 5.6 V, 7.8 V c) Relays – solid state Sugar cube type, SPST, Coil 6V, Power circuit 230 V, 5 A. d) Spring Boards e) Bread Boards f) Tag Boards.		Each 10 No
23	Simple PANEL BOARD/ CUBICAL consisting of bus-bars, CB/MCB/ELCB, meters, HRC fuses, magnetic contactors, cables, earthing points.		01