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

Course Title: **Basics of Electrical & Electronic Engg. Lab**		Course Code	: **15EC12P**
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**

Prerequisites

Basic knowledge of physics and mathematics (tenth-standard level),and principles of electrical and electronic engineering.

Course Objectives

Learn and understand the fundamentals of electrical engineering and components and acquire the knowledge of the principles of relevant laws and applications.

Course Outcomes

At the end of the course, the students will be able to

1. Identify and operate the laboratory equipment and measure electrical quantities.
2. Identify electronic components and understand their characteristics.
3. Apply electrical laws in understanding circuit functions and simple designs.
4. Develop a mini-project related to electrical engineering and prepare a report on it.

Course Outcome		CL	Experiments linked	Linked PO	Teaching Hrs
CO1	Identify and operate the laboratory equipment and measure electrical quantities	***R/U/A***	Unit 1, Expts 1 to 3	1,2,3,4,5, 8,10	12
CO2	Identify electronic components and understand their characteristics.	***R/U/A***	Unit 1, Expts 4 to 5	1,2,3,4,5, 8,10	09
CO3	Apply electrical laws in understanding circuit functions and simple designs.	***R/U/A***	Unit 1, Expts 6 to 18	1,2,3,4,5, 8,10	42
CO4	Develop a mini-project related to electrical engineering and prepare a report on it.	***U/A***	UNIT 2	1,2,3,4,5, 8,9,10	09
		Total sessions include two tests			**78**

Course-Po Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Basics of Electrical & Electronic Engg Lab	3	3	3	3	3	--	--	3	1	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 Contents

UNIT – I: Tutorial and Graded Exercises Duration: 69Hr

Sl. No.	Topic/Exercises	Duration (Hr)
1	Identification of passive components: (i) Given code/color bands/symbols, find the value, and (ii) Given the value, find the code/pattern or bands of colors. (iii) Compare the values of passive components using color code/symbols and meter method.	6
2	Familiarization of Lab tools, tag-board, bread board, printed circuit board (PCB) and transformers.	3
3	Process and classification of soldering. List the precautions to be taken during soldering. Demonstration of qualitative soldering for simple circuits.	3
4	Sketch the front panels of laboratory equipment such as RPS, CRO, Multimeter, LCR meter and Signal Generator. List their functions. Familiarize with their operation and usage.	6
5	Demonstrate the use of Multimeters-Analog and Digital and discuss the precautionary measures to be taken while using them. Measuring of AC/DC voltages and currents using multimeters	3
6	Demonstrate the verification of Ohm's law.	3
7	Experimental verification of effective resistance in the following cases using Ohm's law.*i. Series resistance network, ii. Parallel resistance network* and *iii. Combination network.*	3
8	Measure effective inductance of inductors connected in*i. Series, ii. Parallel* and *iii. Series-Parallel combination* using LCR meter and compare with the theoretical values.	3
9	Measure effective capacitance of capacitors connected in*i. Series, ii. Parallel* and *iii. Series-Parallel combination* using LCR meter and compare with the theoretical values.	3
10	Demonstrate and observe the effect of cells connected in series and parallel.	3
11	Demonstrate Kirchhoff's current law for a simple DC circuit.	3

12	Demonstrate Kirchhoff's voltage law for a simple DC circuit.	3
13	Compute the impedance (magnitude) of a series RLC circuit using Ohm's law and compare it with the theoretical value.	3
14	Demonstrate the operation of CRO: Measure AC and DC Voltages, Frequency and Phase angle.	6
15	Demonstrate the control of an electric lamp using a typical relay and measure the operating/release voltages.	3
16	Determine the characteristics of light dependent resistor (LDR).	3
17	Determine the characteristics of voltage dependent resistor (VDR).	3
18	Open-ended experiment of similar nature and magnitude of the above	3
	Two Internal Assessment Tests	6
	Total	**69**

UNIT – II: Project Activities [CIE- 05 Marks] Duration: 9Hrs

Sl. No.	Activity	Duration (Hrs)
1	Open-ended activity like (i) Collection of catalogues and specification sheets, preparation of a chart displaying symbols of passive components and connectors/cables. (ii) Collection of the contributors (scientists) and contribution details to the field of Electrical and Electronics engineering (At least 10). Or (iii) Any other such activities that can contribute to the student's knowledge in respect of this course.	**5**
2	Record the best practices used in the disposal of E-waste and precautions in the operation of electrical appliances.	**4**

Execution Mode

1. Maximum of 4 students in each batch for project activity.
2. Project activity 1 and 2 are mandatory for every batch.
3. Project activities shall be carried out throughout the semester and present the project report at the end of the semester.
4. Report-size shall be qualitative and not to exceed 10 pages; one report per batch.
5. Each of the activity can be carried out off-class; however, demonstration/presentation should be done during laboratory sessions.
6. Assessment shall be made based on quality of activity, presentation/demonstration and report.

References

1. *Basic Electrical Engineering,* V. K. Mehta and Rohit Mehta, S. Chand and Company Publishers, RE 2012, ISBN 81219087
2. *Fundamentals of Electrical and Electronics Engineering,* B. L. Theraja, S. Chand and Company. REPRINT 2013, ISBN 8121926602
3. *Electronic Components,* Dr. K. Padmanabhan and P. Swaminathan, Lakshmi Publications, 2006.
4. http://www.vlab.co.in/
5. http://electrical4u.com/
6. http://www.electronics-tutorials.ws

Course Delivery

The course will be normally delivered through tutorials of two hours, and four hours of hands-on practice per week. Project activities are carried out off-class throughout the semester.

Course Assessment and Evaluation Scheme

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
DIRECT ASSESSMENT	CIE (Continuous Internal Evaluation)	IA Tests	Students	Two IA Tests (Average of two tests will be computed)	10	Blue books	1 to 4
				Record Writing(Average of Marks allotted for each experiment)	10	Record Book	1 to 4
				Mini Project	05	Report	1 to 4
				Total	25		
	SEE (Semester End Examination)	End Exam		End of the course	50	Answer scripts at BTE	1 to 4
INDIRECT ASSESSMENT	Student Feedback on course		Students	Middle of the course		Feedback forms	1 to 2 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1 to 4, Effectiveness of Delivery of instructions & Assessment Methods

***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 Mini project / Student activities.

MODEL OF RUBRICS FOR ASSESSING STUDENT ACTIVITY

Dimension	Scale					Students exam Reg no/ Score				
	1.Unsatisfactory	2.Developing	3.Satisfactory	4.Good	5.Exemplary	Reg1	Reg2	Reg3	Reg4	Reg5
1.Research and gather information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3				
2.Full fills teams roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	2				
3.Shares work equality	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5				
4.listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	3				
					Total Marks	13/4= 3.25= 04				

Composition of Educational Components

Questions for CIE and SEE will be designed to evaluate the various educational components such as shown in the following table.

Sl. No.	Component	Weightage (%)
1	Remembering and Understanding	25
2	Applying the knowledge acquired from the course	35
3	Analysis	40

Scheme of Evaluation for End-examination

Sl. No.	Scheme	Max. Marks
1	Identification of meters/ tools/equipment's/components/wiresetc.	05
2	Writing circuit diagram and procedure of one experiment	10
3	Conduction	20
4	Result	05
5	Viva-voce	10
	Total	**50**

Note:
1. Candidate shall submit Lab record for the examination.
2. Student shall be allowed to conduct directly even if she / heis unable to write the procedure.

Laboratory Resource Requirements

For a batch of 20Students:

Sl. No.	Equipment	Quantity
1	0-30V at 2/1A RPS with short circuit protection	10
2	Function Generator (0-10MHz)	05
3	Dual Trace Oscilloscope (20/25 MHz).	05
4	Digital multimeters	10
5	Analog multimeters	05
6	Decade resistance boxes	10
7	Decade capacitance boxes	10
8	Decade inductance boxes	10
9	LCR meter	05
10	Electronic components –resistors,inductors,capacitors, transformers, hookup wires ,LDR,VDR, Relay, soldering leadetc	L/S
11	Bread boards, Soldering Gun, Tag Board, 9V battery cells, Bulbs.	L/S

Model Questions for Practice and Semester End Examination

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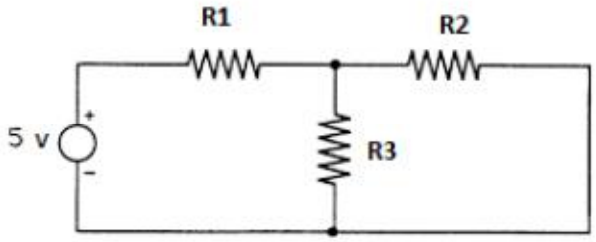
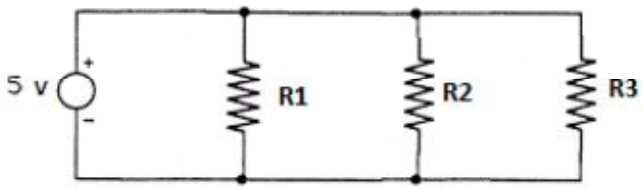
Note: These questions are indicative but not exhaustive.

1. Demonstrate the verification of Ohm's law.
2. Determine the resistance of a given unknown resistor experimentally and compare it with its colour coded value.
3. Compute the effective resistance experimentally for the following combinations: Three resistors are connected in (a) series and (b) parallel.
4. Compute the effective resistance experimentally for the series-parallel combination of resistors.
5. Calculate the effective capacitance experimentally when three capacitors are connected in series and parallel, separately.
6. Calculate effective capacitance experimentally when three capacitors are connected in series-parallel combination.
7. Calculate effective inductance experimentally when three inductors are connected in series and parallel, separately.
8. Calculate effective inductance experimentally when three inductors are connected in series-parallel combination.
9. Construct and test a circuit to turn ON/ OFF a lamp connected to 230 V ac supply using a relay.
10. Demonstrate the verification of Kirchhoff's Current Law (KCL).
11. Demonstrate the verification of Kirchhoff's Voltage Law (KVL).
12. Verify KCL for the following circuit.



13. Verify KCL for the following circuit.



14. Determine the characteristics of an LDR.
15. Determine the characteristics of VDR.
16. Experimentally compare the performance of cells connected in series and parallel combinations.
17. Experimentally determine the impedance of a series RLC circuit with R_1KΩ,L_1mH and C_1μF at a frequency of F1 Hz and compare it with its theoretical value.

18. Design an RLC series circuit to have Z_1 Ω impedance at F_1 Hz and verify it experimentally.
19. Demonstrate the measurement of *sine* wave parameters - Amplitude, Peak to Peak Value, Frequency and Time Period.
20. Demonstrate the generation of *sine* wave of magnitude V1mV Amplitude and frequency F_1KHzusing signal generator and measure its time-period using CRO.

End