## EVALUATION SCHEME and Syllabus- B. TECH I$^{st}$ YEAR (ELECTRICAL ENGINEERING)

| SEMESTER-III | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S. No. | Subject Code | Subject | Type of Course | Periods | | | Evaluation Scheme | | | | End Semester | | Total | Credit |
| | | | | L | T | P | CT | TA | Total | PS | TE | PE | | |
| 1 | IEE101/ IEE201 | Fundamentals of Electrical Engineering | ES | 2 | 1 | 0 | 20 | 10 | 30 | -- | 70 | -- | 100 | 3 |
| 2 | IEE151/ IEE251 | Fundamentals of Electrical Engineering Lab | ES | 0 | 0 | 2 | - | -- | -- | 50 | -- | 50 | 100 | 1 |

| IEE101/IEE201 FUNDAMENTALS OF ELECTRICAL ENGINEERING | | L T P |
|---|---|---|
| | | 3 1 0 |

| | Course Outcomes | *KL/ BL* |
|---|---|---|
| | Upon the completion of this course, the student will be able to: | |
| **CO1** | Apply the concepts of KVL/KCL and network theorems in solving DC circuits. | **3** |
| **CO2** | Analyse the characteristics of single-phase AC electrical circuits and resonance in AC circuits. | **4** |
| **CO3** | Describe the load connection on three-phase AC circuits. Also, identify the application areas of a single-phase transformer and calculate their efficiency. | **2** |
| **CO4** | Understand the working principles of induction motors, synchronous machines, and DC machines and employ them in different areas of applications. | **2** |
| **CO5** | Describe the switches of low-voltage electrical installations and safety precautions. Also, able to understand different electrical measuring instruments. | **2** |

| Syllabus | Contact Hours |
|---|---|
| **Unit -1: DC Circuit Analysis**<br>Types of Elements and Networks, Kirchhoff's law, Ideal and practical voltage and current sources, Mesh and Nodal analysis, Source transformation, Star delta transformation. Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem (Independent and ideal sources based numerical, Source transformation not expected for superposition theorem, Mesh and Nodal analysis.) | **8** |
| **Unit-2: Analysis of Single-Phase AC Circuits**<br>Representation of Sinusoidal waveforms – Average and effective values, Form-factor, and peak factors. Analysis of single-phase AC Circuits consisting of R-L-C combination (Series and Parallel) Apparent, active, reactive power, Power factor. Concept of Resonance in series & parallel circuits, bandwidth and quality factor. | **8** |
| **Unit-3: Three-Phase AC Circuits:** Three-phase balanced circuits, voltage and current relations in star and delta connections and related numerical.<br>**Magnetic Circuits:** Concept of MMF, flux, flux density, reluctance, permeability, field strength, and their units.<br>**Transformers:** Principle of working, EMF equation, Ideal and practical transformers, equivalent circuits, losses and efficiency in transformers.<br>(Numerical problems related to transformer) | **8** |
| **Unit-4: Electrical machines**<br>DC Machines: Principles and Construction, EMF equation of Generator, Classification of DC Generator: Self-excited, Separately excited, shunt and series generator.<br>Principle of DC motor, Torque equation of motor, Series and Shunt motors (simple numerical problems).<br>Three-Phase Induction Motor: Principle & Construction and Applications. | **10** |

| | |
|---|---|
| Working principle of Three-Phase Alternator. | |
| **Unit-5: Measuring Instruments:**<br>Definition and Types of electrical measuring instruments, Construction and working principle of PMMC type, MI type and Dynamometer type instruments.<br>**Electrical Installations:**<br>Introduction of Switch Fuse Unit (SFU), MCB, ELCB, MCCB, ACB. Types of Wires, Cables.<br>Earthing and its types, Safety Precautions to avoid shock. | **8** |


**Text Books:**

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.
2. P.V. Prasad, S. Sivanagaraju,"Electrical Engineering: Concepts and Applications" Cengage.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

**Reference Books:**

1. E. Hughes, "Electrical and Electronics Technology", Pearson.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.
3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

| IEE151/IEE251 Fundamentals of Electrical Engineering Lab | | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 2 |

| | Course Outcomes | *KL/ BL* |
|---|---|---|
| | Upon the completion of this course, the student will be able to: | |
| **CO1** | Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits. | **3** |
| **CO2** | Demonstrate the characteristics of AC circuits connected to the single-phase AC supply and measure power in single-phase electrical circuits. | **4** |
| **CO3** | Measure the voltage ratio of a single-phase transformer. | **3** |
| **CO4** | Identify the type of DC and AC machines based on their construction. | **2** |

**LIST OF EXPERIMENTS**

***Note:*** *A minimum of ten experiments from the following should be performed.*

**(A) Hardware-based experiments**

1. Verification of KCL and KVL.
2. Verification of Thevenin's theorem and Norton's theorem.
3. Verification of Superposition theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit.
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3-phase circuit by two-wattmeter method and determination of its power factor for star and/or delta connected load.
8. Determination of parameters of ac single phase series RLC circuit.
9. Determination of the Voltage ratio and polarity test of a single-Phase Transformer.
10. Demonstration of cut-out sections of machines: dc machine, single-phase induction machine.

**(B) Experiments available on virtual lab**

1. Kirchhoff‟s laws.

Virtual lab link: http://vlab.amrita.edu/?sub=3&brch=75&sim=217&cnt=2

2. Thevenin Theorem.

Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=313&cnt=1

3. RLC series resonance.

Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=330&cnt=1

4. Determination of parameters of ac single phase series RLC circuit.

Virtual lab link: https://vlab.amrita.edu/?sub=1&brch=75&sim=332&cnt=1