| Course code: Course Title | Course Structure | | | Pre-Requisite |
|---|---|---|---|---|
| **EE101: Basic Electrical Engineering-I** | **L** | **T** | **P** | **NIL** |
| | **3** | **0** | **2** | |

**Course Objective:** To familiarize the students with the concepts of electrical circuits, magnetic circuits, transformer and measuring instruments.

| S. NO | Course Outcomes (CO) |
|---|---|
| **CO1** | Classify different types of sources, properties of electrical elements, solve DC networks using various techniques and theorems. |
| **CO2** | Analyze performance of single-phase AC circuits with help of phasor diagrams, apply the knowledge to explain phenomenon of resonance in series and parallel circuit. |
| **CO3** | Analyze and evaluate power in a balanced three phase AC circuit. |
| **CO4** | Solve magnetic circuits, and apply its concepts to understand the operation of single-phase transformer. |
| **CO5** | Describe the operation and working of various analog and digital electrical measuring instruments. |

| S. NO | Contents | Contact Hours |
|---|---|---|
| **UNIT 1** | Introduction: Role and importance of circuits in Engineering, concept of fields, charge, current, voltage, energy, and their interrelationships. V- I characteristics of ideal voltage and ideal current sources, various types of controlled sources, passive circuit components, V-I characteristics and ratings of different types of R, L, C elements. DC Network: Series and parallel circuits, power and energy, Kirchhoff's Laws, delta-star transformation, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Tellegen's theorem. | 10 |
| **UNIT 2** | Single Phase AC Circuits: Single phase emf generation, average and effective values of sinusoids, complex representation of impedance, series and parallel circuits, concept of phasor, phasor diagram, power factor, complex power, real power, reactive power and apparent power, resonance in series and parallel circuits, Q-factor, bandwidth and their relationship, half power points. | 10 |
| **UNIT 3** | Three-Phase AC Circuits: Three phase emf generation, delta and star connection, line and phase quantities, solution of three phase circuits: balanced supply and balanced load, phasor diagram, three phase power measurement by two wattmeter method. | 5 |
| **UNIT 4** | Magnetic Circuits and Transformers: Ampere's circuital law, B-H curve, concept of reluctance, flux and mmf, analogies between electrical and magnetic quantities, solution of magnetic circuits, hysteresis and eddy current losses, mutual inductance and dot convention, single phase transformer – construction and principle of working, auto transformers and their applications. | 12 |
| **UNIT 5** | Measuring Instruments: Analog indicating instruments, PMMC ammeters and voltmeters, damping in indicating instruments, shunt and multipliers, moving iron ammeter and voltmeters, dynamometer type instruments, multimeters, AC watt-hour meters. Digital voltmeters, ammeters, and wattmeters. | 5 |
| | **TOTAL** | **42** |

**REFERENCES**


| S.No. | Name of Books/Authors/Publishers | Year of Publication / Reprint |
|---|---|---|
| **1** | Linear Circuit Analysis: Time, Domain, Phasor and Laplace Transform Approaches Raymond A. De Carlo, Pen-Min Lin, Oxford University Press, 2nd Edition. | 2001 |
| **2** | Basic Electrical Engineering, A.E. Fitzgerald, D. Higginbotham, Arvin Grabel, Tata McGraw-Hill Publishing Company; 5th Edition. | 2009 |
| **3** | Introduction to Electrical Engineering, Mulukutla S. Sarma, Oxford University Press | 2001 |
| **4** | Electrical and Electronic Technology, Edward Hughes, Pearson Education, 10th Edition. | 2010 |
| **5** | Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N.O. Sadiku | 2022 |
| **6** | Electrical Engineering Fundamentals, V. Del Toro, Pearson Education, 2nd Edition. | 2015 |
| **7** | Basic Electrical Engineering, C.L. Wadhwa, New Age International Pvt Ltd Publishers | 2007 |


## Basic Electrical Engineering -2 (BEE II)

| Course code: Course Title | Course Structure | Pre-Requisite |
|---|---|---|

| EE105: Basic Electrical Engineering-II | L | T | P | NIL |
|---|---|---|---|---|
| | 3 | 0 | 2 | |

**Course Objective:** To familiarize the students with the concepts of electrical circuits, magnetic circuits, transformer and rotating electrical machines.

| S. NO | Course Outcomes (CO) |
|---|---|
| CO1 | Classify different types of sources, properties of electrical elements, solve DC networks using various techniques and theorems |
| CO2 | Analyze performance of single-phase AC circuits with help of phasor diagrams, apply the knowledge to explain phenomenon of resonance in series and parallel circuit |
| CO3 | Analyze and evaluate power in a balanced three phase AC circuit |
| CO4 | Solve magnetic circuits, and apply its concepts to understand the operation of single-phase transformer |
| CO5 | Describe the principles and working of various kinds of rotating electrical machines. |



| S. NO | Contents | Contact Hours |
|---|---|---|
| UNIT 1 | Introduction: Role and importance of circuits in Engineering, concept of fields, charge, current, voltage, energy and their interrelationships. V- I characteristics of ideal voltage and ideal current sources, various types of controlled sources, passive circuit components, V-I characteristics and ratings of different types of R, L, C elements. DC Network: Series and parallel circuits, power and energy, Kirchhoff's Laws, delta-star transformation, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Tellegen's theorem. | 10 |
| UNIT 2 | Single Phase AC Circuits: Single phase emf generation, average and effective values of sinusoids, complex representation of impedance, series and parallel circuits, concept of phasor, phasor diagram, power factor, complex power, real power, reactive power and apparent power, resonance in series and parallel circuits, Q-factor, bandwidth and their relationship, half power points. | 8 |
| UNIT 3 | Three-Phase AC Circuits: Three phase emf generation, delta and star connection, line and phase quantities, solution of three phase circuits: balanced supply and balanced load, phasor diagram, three phase power measurement by two wattmeter method. | 4 |
| UNIT 4 | Magnetic Circuits and Transformers: Ampere's circuital law, B-H curve, concept of reluctance, flux and mmf, analogies between electrical and magnetic quantities, solution of magnetic circuits, hysteresis and eddy current losses, mutual inductance and dot convention, single phase transformer – construction and principle of working, auto transformers and their applications. | 10 |
| UNIT 5 | Rotating Electrical Machines: DC Machines, induction machines, synchronous machines, and special electrical machines. | 10 |
| | **TOTAL** | **42** |

| REFERENCES | | |
|---|---|---|
| **S.No.** | **Name of Books/Authors/Publishers** | **Year of Publication / Reprint** |

| | | |
|---|---|---|
| **1** | Linear Circuit Analysis: Time, Domain, Phasor and Laplace Transform Approaches Raymond A. De Carlo, Pen-Min Lin, Oxford University Press, 2nd Edition. | 2001 |
| **2** | Basic Electrical Engineering, A.E. Fitzgerald, D. Higginbotham, Arvin Grabel, Tata McGraw-Hill Publishing Company; 5th Edition. | 2009 |
| **3** | Introduction to Electrical Engineering, Mulukutla S. Sarma, Oxford University Press | 2001 |
| **4** | Electrical and Electronic Technology, Edward Hughes, Pearson Education, 10th Edition. | 2010 |
| **5** | Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N.O. Sadiku | 2022 |
| **6** | Electric Machinery by A Fitzgerald, Charles Kingsley, Stephen Umans | 2017 |
| **7** | Basic Electrical Engineering, C.L. Wadhwa, New Age International Pvt Ltd Publishers | 2007 |

## Basic Electronics and Communication Engineering (BEC)