|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UES013: Electrical & Electronics Engineering** | | | | |
|  | L | T | P | Cr |
| 3 | 1 | 2 | 4.5 |
| **Course Objective**: To introduce the basic concepts of electrical and electronics engineering. | | | | |
| **Unit 1: DC Circuits:**   * Introduction to circuit elements; independent and dependent current and voltage sources; * Kirchhoff’s laws; mesh and node analysis; source transformations; * network theorems: Superposition theorem, Thevenin’s and Norton’s theorem, Maximum power transfer theorem; * star-delta transformation; * transient response of R-L and R-C circuits.   **Unit 2: AC Circuits & Magnetic circuits:**   * Concept of phasor, phasor representation of circuit elements; * analysis of series and parallel AC circuits; * concept of real, reactive and apparent powers; * resonance in RLC series circuits; * balanced three phase circuits: voltage, current and power relations for star and delta arrangement; * three phase power measurement using two-wattmeter method; * Analogy between electric and magnetic circuits; * series and parallel magnetic circuits; equivalent inductances; * single-phase transformer.   **Unit 3: Digital Logic Design:**   * Number systems, Positive and negative representation of numbers, * Signed-number representation, Binary arithmetic, * Postulates and theorems of Boolean Algebra, * Algebraic simplification, Sum of products and product of sums formulations (SOP and POS), * Logic Gates and Universal Gates, Minimization of logic functions, * Karnaugh Maps, Logic implementation using Gates, * Adder, Decoder, MUX. * Introduction to Flip-Flops and their types.   **Unit 4: Electronic Devices & Operational Amplifier Circuits**:   * p-n junction diode: V-I characteristics of diode, * Operation of Bipolar Junction Transistor, CB and CE configuration, * Fixed Bias Circuit for CE configuration, Transistor as a switch. * The ideal operational amplifier, the inverting, non-inverting amplifiers, * Op-amp as a summing amplifier. | | | | |
| **Laboratory Work:** Kirchhoff’s laws, network theorems, ac series and parallel circuit, three phase power measurement, magnetic circuit, tests on transformer, resonance in AC circuit, combinational circuits, flip flops, shift register and binary counters, asynchronous and synchronous up/down counters, BJT characteristics. | | | | |
| **Updated Course Learning Objectives (CLO)**   1. After completion of this course, the students will be able to: 2. Apply various networks laws and theorems to solve dc circuits. 3. Compute different ac quantities with phasor representation. 4. Comprehend the operation in magnetic circuits, single phase transformer. 5. Recognize and apply the number systems and simplification of Boolean expressions using Boolean algebra and K-Map. 6. Solve and implement logical functions using logic gates, decoders, and multiplexers, 7. Discuss and explain the working of Flip-Flops, diode, transistor and operational amplifier, their configurations and applications. | | | | |
| **Text Books**  *1. Hughes, E., Smith, I.M., Hiley, J. and Brown, K., Electrical and Electronic Technology, Prentice Hall (2008) 10th ed.*  *2. Nagrath, I.J. and Kothari, D.P., Basic Electrical Engineering, Tata McGraw Hill (2002).*  *3. Boylestad, R.L. and Nashelsky, L., Electronic Devices & Circuit Theory, Perason (2009).*  *4. Mano M. M. and Ciletti, M.D., Digital Design, Pearson, Prentice Hall, (2013).* | | | | |
| **Reference Books**   1. *Chakraborti, A., Basic Electrical Engineering, Tata McGraw−Hill (2008).* 2. *Del Toro, V., Electrical Engineering Fundamentals, Prentice−Hall of India Private Limited (2004).* 3. *David Bell, Electronics Devices and Circuits, Oxford Publications (2009).* | | | | |