|  |  |  |
| --- | --- | --- |
| **Course code** | **Course Title** | **Core/ Elective** |
| 6ES202EE | Elements of Electrical and Electronics Engineering | Core |
| L | T | P/D | Credits | CIE | SEE |
| 3 | 0 | 0 | 3 | 40 | 60 |
| **Prerequisite:** Basics of Oscillations, Crystals, magnetic materials.**Course Objectives:**The objective of this course is to make the student* Familiarize with electrical networks, circuits and different Laws used to solve electrical circuits.
* Understand various network reduction techniques to analyze electrical circuits.
* Understand the concept of network theorems for reducing complex networks.
* Understand the characteristics of diodes and transistor configurations.
* Understand the design concepts of biasing of BJT and FET.

**Course Outcomes:**After completion of the course, the student will be able to* **CO1.**Understand the concepts of electrical circuits and Analyze complex electrical circuits with the help of different network theorems.
* **CO2.**Understand the basic concepts of Electrical DC Machines.
* **CO3.**Understand the basic concepts of transformers and three phase induction motors.
* **CO4.**Analyze the rectifiers and regulator circuits.
* **CO5.**Analyze the performance of BJTs, FETs on the basis of their operation and working
 |
| **Unit-I: (08 Hrs)****Introduction to Electrical Circuits:** Circuit Concept, R-L-C Parameters, Voltage and Current Sources, Source Transformation, Voltage – Current relationship for Passive Elements, Ohm‘s Law, Kirchhoff's Laws, Series, Parallel, Series Parallel Combinations, Superposition, Thevenin's, Norton's theorems.**Unit-II: (08 Hrs)****DC Machines:** Principle of operation of Generator and Motor-construction of DC machine- EMF equation-Torque equation- Armature circuit equation for motoring and generation, Types of field excitations. Open circuit characteristic of separately excited DC generator. Speed control methods, Losses and Efficiency.**Unit-III: (09 Hrs)****Introduction to AC fundamentals, Transformers:** Principle of operation, construction and operation of single-phase transformers, ideal and practical transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency. Autotransformers - construction, principle of operation applications, Three-phase transformer - construction, types of connection and their comparative features.**Three-phase induction motors:** Three-phase induction motors–Construction, |

types, production of a rotating magnetic field-principle of operation. Losses and efficiency.

## Unit-IV: (07 Hrs)

**P-N Junction Diode:** Characteristics, Half wave rectifier, Full wave rectifier, filters, ripple, regulation, TUF and efficiency, Zener diode and Zener diode regulators. CRT construction and CRO applications.

## Unit-V: (07 Hrs)

**Transistors**: BJT construction and working, modes of operation, configurations of BJT (CB, CE, CC), small signal h-parameter model of CE, CE amplifier analysis. Construction and working of JFET, V-I characteristics of JFET.

**Introduction to Oscillators:** LC oscillators, RC oscillators (Qualitative Treatment only).

## Text Books:

T1. Electrical Circuit Analysis, William H Hayt and Jack Kemmerly , 8th Edition, 2014 (Unit 1-3)

T2. Electronic Devices, Floyd, Pearson Publications, Seventh Edition, 2019**.** (Unit 4-5)

## References/ Suggested Reading:

R1. ―Basic Electrical Engineering‖, N. K. De, Universities Press, 2015.

R2. ―Fundamentals of Electrical Engineering and Electronics‖, J.B. Gupta, S. K. Kataria& Sons Publications, 2002.

R3. ―Electronic Devices and Circuits‖, Theodore F Bogart, Pearson Publications,2004.

R4. ―Electronics Devices and Circuits‖, J B Gupta, Katson Educational Series, 6th Edition.

R5. Circuit Theory Analysis and Synthesis by Abhijit Chakrabarti ,Dhanpat Raj & Co., 2018.(Unit 1-3).