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| Course code | Course Title | Core/ Elective |
| **5ES203EE** | ELEMENTS OF ELECTRICAL ENGINEERING | Core |
| L | T | P/D | Credits | CIE | SEE |
| 3 | 0 | 0 | 3 | 40 | 60 |
| **Prerequisite:** Basic elements of networks and Physics.**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.
* To explain the working principles of Electrical Machines and transformers.

**Course Outcomes** After completion of the course, the student will be able to* CO.1Analyze AC & DC electrical circuits to compute
* Various parameters of electrical energy.
* CO.2 Analyze complex electrical circuits with the help of different network theorems.
* CO.3 Analyze DC & AC Transients with the help of various networks and to understand the resonance concepts.
* CO.4 Understand the working principles of Electrical DC Machines.
* CO.5 Understand the working principles of electrical AC machines.
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| **Unit-I: (07 Hrs.)****Introduction to Electrical Circuits:** Circuit Concept, Electrical circuit elements (R, L and C), Voltage and Current Sources, Independent and Dependent Sources, Time, frequency domain and Phasor domain Representation, Power fundamentals **(**real power, reactive power, apparent power, power factor), Ohm’s Law, Kirchhoff's Laws, Source Transformation, Nodal & Mesh Analysis, Duality, dot Convention, Magnetic Coupling, Numerical Problems.**Unit-II: (07 Hrs.)****Network Theorems:** Superposition, Thevenin’s, Norton’s, Maximum Power Transfer, Milliman's, Tellegen's theorems, Numerical Problems on ac and dc circuits.**Unit-III: (08 Hrs.)****AC & DC Transients and Resonance:** AC & DC Transients for R-L, R-C, |

R-L-C Circuits, Series Resonance, Parallel Resonance, Numerical Problems.

## Unit-IV: (8 Hrs)

**DC Machines: DC Generators -** Dynamically induced e.m.f, Fleming’s Right hand and Left-hand rules, Construction, and principle of operation of DC generator, EMF equation, Types of DC Generators, OCC characteristics, applications.

**DC Motors:** Principle of operation of DC Motor, Types of DC motors, applications.

## Unit-V: (09 Hrs)

**AC Machines: Transformers-**Electromagnetic induction, Faradays laws, statically induced e.m.f, Lenz law, B-H characteristics, ideal and practical transformer, losses and efficiency, Auto-transformer, and three-phase transformer connections.

**Three Phase Induction motor:** Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, squirrel cage IM, slip-ring IM, Applications.

# Text Books:

T1. Fundamentals of Electric Circuits, Charles k. Alexander and Matthew N.

O. Sadiku, Tata McGraw Hills Education, Edition 3, 2013 .(Unit 1-3) T2. J.B. Gupta, Fundamentals of Electrical Engineering and Electronics‖ S.K. Kataria& Sons Publications, 2002.Unit (1-5)

# References/ Suggested Reading:

R1. ―Electrical Technology‖, B.L. Theraja, A.K. Theraja, Volume-II,S. Chand & Co.

Ltd.

R2. “Fundamentals of Electrical Engineering and Electronics‖, J.B. Gupta, S.

K. Kataria. & Sons Publications, 2002.

R3. Electrical Circuit Analysis, William H Hayt and Jack Kemmerly , 8th Edition, 2014 (Unit 1-3)

R4. Circuit Theory Analysis and Synthesis by Abhijit Chakrabarti,Dhanpat Raj & Co., 2018.(Unit 1-3)

R5. N.K. De, Basic Electrical Engineering‖, Universities Press, 2015. (Unit 1-5)

R6. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, - Basic Electrical Engineering,Tata McGraw Hill, Publications, 2009. (1-5)