(FE-119) - Fundamentals of Electrical Engineering

Course Outline:

Theory:

1. **Electrical Elements and Circuits:**
    1. Energy and energy transfer.
    2. Electric Charge.
    3. Electric Current.
    4. Potential difference and voltage.
    5. Electric power and energy
    6. Electric circuit Sources and Elements.
    7. Resistance, Ohm's law.
    8. Inductance.
    9. Capacitance.
    10. Fundamental circuit laws.
    11. Kirhhoff's Laws.
    12. Direct application of fundamental laws to simple resistive networks.
    13. Node voltage and loop current methods.
2. **Steady State AC Circuits:**
    1. An introduction to periodic functions.
    2. RMS or effective Average and maximum values of current and voltage for sinusoidal signal wave forms.
    3. An introduction to phasor method of analysis.
    4. Applications of phasor methods to simple AC circuits.
    5. Power and reactive power.
    6. Maximum power conditions.
3. **Magnetic Circuits and Transformers:**
    1. Magnetic effects of electric current.
    2. Magnetic circuit concepts.
    3. Magnetization curves.
    4. Characteristics of magnetic materials.
    5. Magnetic circuits with AC excitation.
    6. Hysteresis and eddy current losses.
    7. Introduction to transformer.
    8. The Ideal transformer.
4. **Electromechanical Energy Conversion:**
    1. Basic Principles.
    2. Generated voltage.
    3. Electromagnetic Torque.
    4. Introduction of Magnetic Fields.
    5. Alternating Current Generators.
    6. Commutator Action.
    7. DC Machines.
    8. Direct Current Generators.
    9. Electric Motors.
    10. Losses and Efficiency.
    11. Machine Application Consideration.
5. **Sinusoidal Steady State Analysis:**
    1. Network Response to Sinusoidal Driving Functions.
    2. Complex Impedance and Admittance Functions
    3. Development of Concept of Phasors
    4. Power Consideration.
    5. Complex Power.

6. Maximum Power Transfer.
7. Tuned Circuits.
8. Series and Parallel RLC Tuned Circuits.
9. Definition of Quality Factor.

List of Practicals:

1. To determine the voltage of series circuit
2. To determine the voltage of parallel circuit.
3. To determine the current through mesh analysis
4. To determine the voltage across nodes through nodal analysis of the circuit
5. To determine the voltage across nodes through nodal analysis of the circuit
6. To determine the voltage across Resistor in the circuit.
7. To study the filter circuit and response
8. To study the response of an RC circuit when applied with a sudden dc voltage source.
9. To study the response of a Driven RC circuit when applied with a sudden dc voltage source.
10. To Study the response of Parallel Resonant Circuit
11. To study the response of Series Resonant Circuit
12. To study source free RLC circuit and determine its response mathematically and graphically
13. To determine the transient analysis and plot transient analysis of RL circuit using PSpise
14. To determine the transient analysis and plot transient analysis of RLC circuit using PSpise.
15. Determine Natural Response of an RLC circuit.
16. To study source free RL circuit and determine its response mathematically and graphically

Teaching Methodology:

- Lecturing, Student Engagement
- Quizzes and Assignments, uploading suggested resources on course website.
- Semester Project

Suggested Assessment:

Theory (100%)

- Sessional (20%)
- Quiz (12%)
- Assignment (8%)
- Midterm (30%)
- Final Term (50%)

Laboratory (100%)

Text and Reference Books:

1. Engineering Circuit Analysis by William Hayt, 7th Edition, 2006. ISBN: 978- 0073263182
2. Fundamentals of Electric Circuits by Charles K.Alexander, Matthew N. O. Sadiku. 4th Edition, 2008.ISBN 978-0077263195