Basic Electrical and Electronics Engineering

EG2106CT

Year: II **Total: 7 hours /week**

Part: I **Lecture: 3 hours/week**

Tutorial: 1 hour/week

Practical: … hours/week

Lab: 3 hours/week

Course description:

This course is designed to understand fundamental concept of electric and electronic circuits.

Course objectives:

After completion of this course students will be able to:

1. Differentiate between active and passive elements and circuits.
2. Identify and explain the working principle of electric circuits.
3. Identify and explain the working principle of electronic circuits.

Course Contents:

Theory

Unit 1. Basic Electric System [6 Hrs.]

1.1. Constituent parts of an electric system (Source, Load, Communication and Control)
1.2. Current flow in a circuit
1.3. Electromotive Force and Potential Difference
1.4. Electrical Units
1.5. Passive Components: Resistance, Inductance & Capacitance, Series and Parallel Combinations
1.6. Voltage and Current Sources: Independent, Dependent, VCVS, VCCS, CCCS, CCVS
1.7. Ohm's Law
1.8. Temperature rise and Temperature Coefficient of Resistance

Unit 2. DC Circuits and Network Theorems [6 Hrs.]

2.1. Power and Energy
2.2. Kirchhoff's Law and Its Application: Nodal Analysis and Mesh Analysis
2.3. Star – Delta and Delta – Star Transformation
2.4. Superposition Theorem
2.5. Thevenin's Theorem
2.6. Norton's Theorem
2.7. Maximum Power Transfer Theorem
2.8. Reciprocity Theorem

Unit 3. Alternating Quantities [4 Hrs.]

3.1. AC system
3.2. Waveform, Terms and Definitions
3.3. Average and rms values of Current and Voltage
3.4. Phasor Representation

Unit 4. Single – Phase AC Circuits [4 Hrs.]

4.1. AC in Resistive Circuits
4.2. Current and Voltage in an Inductive circuit

4.3. Current and Voltage in an Capacitive circuit
4.4. Concept of Complex Impedance and Admittance
4.5. AC Series and Parallel Circuits
4.6. RL, RC and RLC Circuit Analysis and Phasor Representation

Unit 5. Power in AC Circuits [5 Hrs.]

5.1. Power in Resistive Circuits
5.2. Power in Inductive and Capacitive Circuits
5.3. Power in Circuits with Resistance and Reactance
5.4. Active and Reactive Power: Power Factor, Importance and Measurement of Power Factor

Unit 6. Diode [6 Hrs.]

6.1. Conductor, Insulator and Semiconductor
6.2. Types of Semiconductors: Intrinsic and Extrinsic, P type and N type
6.3. Semiconductor Diode Characteristics
6.4. Diode Circuits: Clipper and Clamper Circuits
6.5. Zener Diode, LED, Photodiode, Varacter Diode, Tunnel Diode
6.6. DC Power Supply: Rectifier (Half – Wave and Full - Wave), Zener Regulated Power Supply

Unit 7. Transistor [6 Hrs.]

7.1. BJT: Types, Configurations, Modes of Operations, Working Principle
7.2. Biasing of BJT
7.3. BJT as an Amplifier and a Switch
7.4. Small and Large Signal Models
7.5. BJT as Logic Gates
7.6. Concept of Differential Amplifier using BJT

Unit 8. MOSFET [4 Hrs.]

8.1. Types and Construction of MOSFET
8.2. Working Principle of MOSFET
8.3. Biasing of MOSFET
8.4. Construction and working of CMOS
8.5. MOSFET and CMOS as Logic Gates

Unit 9. The Operational Amplifier (Op - Amp) [4 Hrs.]

9.1. Basic Model, Ideal and Real Characteristics, Virtual Ground Concept
9.2. Inverting and Non – Inverting Mode Amplifier
9.3. Some Applications: Summing Amplifier, Differentiator, Integrator, Comparator

Practical: [45 Hrs.]

1. Measurement of Voltage, Current and Power in DC Circuits
   a) Verification of Ohm's Law
   b) Temperature Effect in Resistance
2. Kirchhoff's Current and Voltage Law
   a) Evaluate Power from V and I
   b) Note Loading Effects in Meters
3. Measurement of Amplitude, Frequency and Time in Oscilloscope
   a) Calculate and Verify Average and rms Values

b) Examine Phase Relation in RL and RC Circuits

4. Measurement of Alternating Quantities
   a) R, RL, RC Circuits with AV Excitation
   b) AC Power, Power Factor, Phasor Diagram
5. Diode Characteristics, Rectifiers and Zener Diode
6. BJT Characteristics
7. MOSFET Characteristics
8. Voltage Amplifier using OP – Amp, Comparators

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Basic Electric System	6	10
2	DC Circuits and Network Theorems	6	10
3	Alternating Quantities	4	8
4	Single – Phase AC Circuits	4	8
5	Power in AC Circuits	5	8
6	Diode	6	10
7	Transistor	6	10
8	MOSFET	4	8
9	The Operational Amplifier (Op - Amp)	4	8
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. B. L. Theraja and A. K. Theraja, “A Textbook on Electrical Technology”, S Chand, Latest Edition
2. J. R. Cogdell, “Foundations of Electrical Engineering”, Prentice Hall, Latest Edition
3. J. B. Gupta, “A Textbook on Electrical Technology”, Katson, Latest Edition
4. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, Latest Edition
5. Thomas L. Floyd, “Electronic Devices”, Pearson Education, Latest Edition