EC-101 Electrical Sciences

3-1-0-8

Course Instructors

1. Dr. R. Sinha
2. Prof. G. B. Shrestha

(L1 (Div I :ME and CE & Div III:CSE, EPH and M&C))

3. Prof. A. Gogoi
4. Prof. R. Bhattacharjee

(L2 (Div II :ECE, EEE and BT & Div IV:CL, CST and DD))

Syllabus

1. Circuit Analysis Techniques:

Circuit elements, Simple RL and RC Circuits, Ohm's law, Kirchoff's laws, Nodal Analysis, Mesh Analysis, Linearity and Superposition, Source Transformations, Thevenin's and Norton's Theorems, Sinusoidal Forcing Function, Complex Forcing Function, Phasor Relationship for R, L and C, Impedance and Admittance, Phasor Diagrams, Response as a function of ω.

2. Diodes and Transistors:

Semiconductor Diode, Zener Diodes, Rectifier Circuits, Wave Shaping Circuits, Bipolar Junction Transistors, Field-Effect Transistors, Transistor Biasing, Transistor Small Signal Analysis, Transistor Amplifiers.

3. Operational Amplifiers:

Op-amp Equivalent Circuit, Practical Op-amp Circuits, DC Offset, Constant Gain Multiplier, Voltage Summing, Voltage Buffer, Controlled Sources, Instrumentation Circuits, Active Filters and Oscillators.

4. Logic Gates and Combinational Circuits:

Number Systems and Codes, Logic Gates, Boolean Theorems, De Mogan's Theorems, Sum-of Product Form, Algebraic Simplification, Karnaugh Map Method, Parity Generator and Checker, Inhibit Circuits.

5. Sequential Circuits and Arithmetic Circuits:

NAND and NOR gate Latches, S-C Flip-Flop, J-K Flip-Flop, D Flip-Flop, Data Storage, Serial Data Transfer, Frequency Division and Counting, Binary Addition, 2's Complement System, Full Adder, BCD Adder.

6. Transformers and AC Machines:

Ideal Transformer, Circuit Model of Transformer, Determination of Parameters of Circuit Model of Transformer, Voltage Regulation, Efficiency, Three Phase Induction Motor, Three Phase Synchronous Generator, Induced Voltage, Electromagnetic Torque, Equivalent Circuit of Three Phase Induction Motor, Torque Speed Characteristic.

7. Fractional-kW Motors and DC Machines:

Single Phase Induction Motors, Characteristics and Typical Applications, Stepper Motors, Construction Features, Methods of Operations, DC Generator and DC Motor Analysis, Methods of Excitation, Speed Torque Characteristics and Speed Control of DC Machines.

8. Electrical Engineering Systems:

Transmission and Distribution Power Systems, Open-loop and Closed-loop Control Systems, Satellite Control System, Communication System, Amplitude Modulation and Demodulation, Speech Analysis and Synthesis Systems.

Texts:

1. W.H. Hayt, J.E. Kemmerly, S.M.Durbin: Engineering Circuit Analysis; Tata McGraw-Hill, 6th Edition, 2006.

2. R.L. Boylestad and L. Nashelsky: Electronic Devices and Circuit Theory; Pearson Education, 9th Edition, 2007.

1. R.J. Tocci, N.S.Widmer, G.L.Moss: Digital Systems Principles and Applications; Pearson Education, 9th Edition, 2007.

4. Hughes: Electrical and Electronic Technology, Pearson Education, 9th Edition, 2009.

References

1. R.J. Smith and R.C. Dorf: Circuits, Devices and Systems; John Wiley & Sons, 1992.

2. Irving L. Kosow : Electric Machinery and Transformers; PHI,2e,2003.

3. V. Del Toro: Electrical Engineering Fundamentals; PHI, 1994.

Evaluation Components and Weights

- Quiz-1 10 marks (04.09.2014)
- Quiz-2 10 marks (30.10.2014)
- Mid-Semester Exam 30 marks (24.09.2014)
- End-Semester Exam 50 marks (24.11.2014)
- Minimum 75% attendance requirement
- Tutorial Classes will start from 07.08.2014