SEMESTER 2nd

MAJOR COURSE

EEM222J: ELECTRONICS EQUIPMENT MAINTENANCE (EEM) (DIGITAL ELECTRONICS AND LINEAR CIRCUITS - TESTING AND TROUBLESHOOTING)

(CREDITS: THEORY-04, PRACTICALS-02)

Learning objectives

- *To acquire knowledge about number systems and their interconversion and study basics of Boolean algebra.*
- *To study various logic families and gain knowledge about various combinational and sequential logic circuits.*
- *To study basics of OP-AMPS and their applications.*

Unit I: Number system & Boolean Algebra

Number Systems, Introduction to Decimal, Binary, Octal, Hexadecimal Number systems, BCD codes, Inter-conversions of Decimal, Binary and BCD numbers, Excess-3 and Gray codes, Logic Gates: Different Logic Gates (AND, OR, NOT, NAND, NOR, EXOR), Positive and Negative logic.

Boolean Algebra: Boolean operations, logic expressions, DeMorgan's theorems, minterms, maxterms, SOP and POS form of Boolean expressions for gate network, simplification of Boolean expression using Boolean algebra and Karnaugh map techniques (upto 4 variables).

Unit II: Logic Families & Circuits

Logic Families: TTL, ECL and CMOS parameters (power dissipation, speed, supply requirements, Logic level, Fan in, Fan out), Noise Immunity. Combinational Circuits: Encoders and Decoders, Multiplexers and Demultiplexers, Adders and Subtractors. Trouble shooting combinational logic circuits.

Unit III: Digital Circuits

Sequential Logic Circuits: Flip Flops- SR latch using NAND gates, SR flip-flop, JK flip flop, Master Slave JK Flip Flop, D type flip-flop, T type flip-flop. Shift Register and Counters- serial in- serial out, serial in - parallel out, parallel in - serial out, parallel in-parallel out configurations-Ring counter, Asynchronous counters, synchronous counters, up/down asynchronous counter, Mod-counter. Trouble shooting sequential logic circuits.

Unit-IV: Operational Amplifiers

Operational Amplifiers and its Applications, Characteristics and Measurements, Emitter Coupled Differential Amplifier, Transfer Characteristics, Voltage gain, Inverting and Non-inverting amplifiers, Voltage follower, Phase inverter, Scale changer, integrator and Differentiator circuits, Summing and Difference Amplifier, 555 Timer: Astable and Monostable operation. Trouble shooting Linear ICs (LM 714 and 5555.)

RECOMMENDED BOOKS:

1. Morris M. Mano, Digital Design, Pearson Pub.
2. A.P. Malvino, Digital Principles and Applications, McGraw Hill International Editions (Fourth Edition)
3. R.P. Jain, Modern Digital Electronics, Tata McGraw Hill Pub (Third Edition).
4. Thomas L. Floyd, Digital Fundamentals-Universal Book stall.
5. R.A. Gayakwad, Operational Amplifiers and Linear Integrated Circuits, PHI
6. Operational Amplifiers by David Bell

LABORATORY (2 Credits)

Practical work includes the detailed explanation of all the circuit components and blocks of the system. A. full demonstration of the system is necessary before proceeding with the hands-on experimentation. At least 10 experiments from the following:

Practicals:

1. Study of basic gates (verification of truth table) using ICs.
2. Design and realization of AND, OR and NOT gates using diodes / transistors.
3. Construction of basic gates using NAND / NOR gates.
4. Construction and Study of half adder using NAND gates.
5. Study JK and D Flip Flop using IC's.
6. Design and realization of adder and subtractor (using basic gates).
7. Design and realization of adders and subtractor using universal gates.
8. Design and realization of Multiplexers.
9. Design and realization of De-multiplexers.
10. Design and realization of SR flip flop using NAND and NOR gates.
11. Design and realization of JK flip flop using NAND and NOR gates.
12. Design and realization of D flip flop using NAND and NOR gates.
13. Design and realization of T flip flop using NAND and NOR gates.
14. Study JK and D flip-flop using IC's.
15. To study the various characteristics of 741 OP-amp.
16. To study OP-amp as
    (a) Adder (b) Subtractor (c) Differentiator (d) Integrator
17. Study the Input Offset parameters of Op-Amp.
18. Study of inverting and Non-Inverting Amplifier using Op-Amps.