Under Graduate Core Courses

Semester II

ELECTRONICS-DSC 1B: LINEAR AND DIGITAL INTEGRATED CIRCUITS

(Credits: Theory-04, Practicals-02) Theory: 60 Lectures

UNIT I

Operational Amplifiers (Black box approach): Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configuration, Frequency Response. CMRR. Slew Rate and concept of Virtual Ground.

Applications of Op-Amps: (1) Inverting and non-inverting amplifiers, (2) Summing and Difference Amplifier, (3) Differentiator, (4) Integrator, (5) Wein bridge oscillator, (6) Comparator and Zero-crossing detector, and (7) Active low pass and high pass Butterworth filter (1 st order only). (15 Lectures)

UNIT II

Number System and Codes: Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, BCD code. Binary, octal and hexadecimal arithmetic; addition, subtraction by 2's complement method, multiplication.

Logic Gates and Boolean algebra: Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Basic postulates and fundamental theorems of Boolean algebra.

(15 Lectures)

UNIT III

Combinational Logic Analysis and Design: Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh map minimization up to 4 variables for SOP).

Arithmetic Circuits:Binary Addition. Half and Full Adder. Half and Full Subtractor, 4- bit binary Adder/Subtractor.

Data processing circuits: Multiplexers, De-multiplexers, Decoders, Encoders.

Clock and Timer (IC 555): Introduction, Block diagram of IC 555, Astable and Monostable multivibrator circuits. (15 Lectures)

UNIT IV

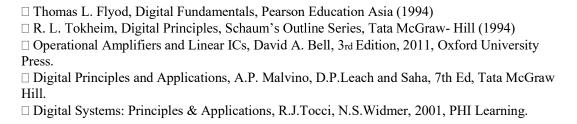
Sequential Circuits: SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop. **Shift registers:** Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).

Counters (4 bits): Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter.

D-A and A-D Conversion: 4 bit binary weighted and R-2R D-A converters, circuit and working. Accuracy and Resolution.A-D conversion characteristics, successive approximation ADC. (Mention of relevant ICs for all). (15 Lectures)

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Recommended Books:



Semester II

ELECTRONICS LABORATORY DSC 1B

LAB: LINEAR AND DIGITAL INTEGRATED CIRCUITS

60 Lectures

At least 05 experiments each from section A and B

Section-A: Op-Amp. Circuits (Hardware)

- 1. To design an inverting amplifier using Op-amp (741,351) for dc voltage of given gain
- 2. (a) To design inverting amplifier using Op-amp (741,351) & study its frequency response
 - (b) To design non-inverting amplifier using Op-amp (741,351) & study frequency response
- 3. (a) To add two dc voltages using Op-amp in inverting and non-inverting mode
 - (b) To study the zero-crossing detector and comparator.
- 4. To design a precision Differential amplifier of given I/O specification using Opamp.
- 5. To investigate the use of an op-amp as an Integrator.
- 6. To investigate the use of an op-amp as a Differentiator.
- 7. To design a Wien bridge oscillator for given frequency using an op-amp.
- 8. To design a circuit to simulate the solution of simultaneous equation and 1st /2nd order differential equation.
- 9. Design a Butterworth Low Pass active Filter (1st order) & study Frequency Response
- 10. Design a Butterworth High Pass active Filter (1st order) & study Frequency Response
- 11. Design a digital to analog converter (DAC) of given specifications.

Section-B: Digital circuits (Hardware)

- 1. (a) To design a combinational logic system for a specified Truth Table. (b) To convert Boolean expression into logic circuit & design it using logic gate ICs. (c) To minimize a given logic circuit.
- 2. Half Adder and Full Adder.
- 3. Half Subtractor and Full Subtractor.

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- 4. 4 bit binary adder and adder-subtractor using Full adder IC.
- 5. To design a seven segment decoder.
- 6. To design an Astable Multivibrator of given specification using IC 555 Timer.
- 7. To design a Monostable Multivibrator of given specification using IC 555 Timer.
- 8. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
- 9. To build JK Master-slave flip-flop using Flip-Flop ICs
- 10. To build a Counter using D-type/JK Flip-Flop ICs and study timing diagram.
- 11. To make a Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs.