

UNIVERSITY OF MADRAS
B.Sc. DEGREE COURSE IN PHYSICS
SYLLABUS WITH EFFECT FROM 2020-2021

BPS-CSE2A

ELECTIVE-II(A): INTEGRATED ELECTRONICS
(Common to B.Sc.Physics with Computer Applications-IV Sem.)

Lecture: 60 Hours

Tutorial: 15 Hours

Credits:4

Course Objectives:

- To study the different number systems associated with digital computation
- To introduce the counters and registers.
- To have in-depth knowledge in arithmetic operations of an operational amplifier.

Learning Outcomes:

On completion of the course the students will have:

- Through knowledge on different number systems
- The skill to simplify the logics using Karnaugh map and Boolean algebra
- Detailed knowledge in storing and retrieving a data through mux and demux
- The skill to customize the counters to the need through serial and parallel counters

UNIT I: FUNDAMENTAL DIGITAL ELECTRONICS (12 Hours)

Number systems – Binary – Hexadecimal – Binary addition – subtraction (1's and 2's compliment method) – Multiplication - Division - BCD – Conversion – Simplification of logic circuits - using (i) Boolean algebra, (ii) Karnaugh map – Demorgan's theorems -NAND and NOR as Universal Building Blocks.

UNIT II: COMBINATIONAL LOGIC CIRCUITS (12 Hours)

Binary Half & Full adder and Subtractor Circuits - BCD Half & Full Adder and Subtractor Circuits – 4 Bit Binary Adder/Subtractor (IC 7483) - Encoder – Decoder - Multiplexer - Demultiplexer.

UNIT III: SEQUENTIAL LOGIC CIRCUITS (12 Hours)

1 bit Memory-Latch –R-S flip flop- J-K flip flop, D flip flop and T-flip flops -Race around condition - J-K Master/Slave flip flop – Asynchronous and Synchronous Counters - BCD counter – Up/Down counters - Ring and Twisted Ring Counter-Shift Registers - Serial And Parallel Registers.

UNIT IV: OP-AMP- BASIC APPLICATIONS (12 Hours)

Characteristics Parameters – Differential Gain – CMRR – Slew Rate – Bandwidth -Applications – Unity Follower, Inverter, Non-Inverter, Integrator, Differentiator, Summing, Difference and Averaging Amplifier - Solving Simultaneous Equations - Comparator - Square Wave Generator - Schmitt Trigger-Wien's Bridge Oscillator

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UNIT V: TIMER, DAC/ADC

(12 Hours)

Timer 555 - Internal Block Diagram and Working – Astable Multivibrator–Monostable Multivibrator-Schmitt Trigger-D/A Converter - Binary Weighted Method - A/D Converter – Successive Approximation Method.

Books for Study:

1. Digital Principles and Application, Malvino Leach, Tata McGraw Hill, 4thEdition(1992).
2. Digital Fundamentals, Thomas L. Floyd, Universal Book Stall, New Delhi(1998).
3. Introduction to Integrated Electronics, V.Vijayendran, S. Viswanathan (Printersand Publishers) Pvt. Ltd., Chennai (2005).
4. OP - AMPs and Linear Integrated Circuits, Ramakant A. Gayakwad, Prentice Hall of India (1994).

Books for Reference:

1. Digital Electronics, Practice Using Integrated Circuits - R.P.Jain – Tata McGrawHill(1996).
2. Linear Integrated Circuits, D. Roy Choudhury and Shail Jain - New AgeInternational (P) Ltd.(2003).
3. Electronics, Analog and Digital by I.J. Nagrath - Prentice - Hall of India,NewDelhi(1999).
4. Integrated Electronics, J.Millman and C.Halkias, Tata McGraw Hill, New Delhi(2001)
5. <https://nptel.ac.in/courses/117107094/>