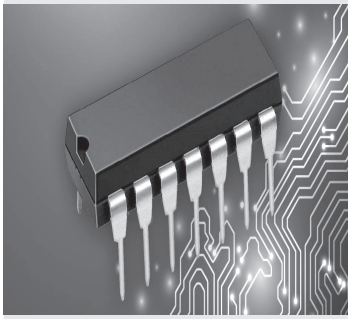
19BM212 DIGITAL ELECTRONIC CIRCUITS



SOURCE:
https://
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Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	8	-	12	3	2

PREREQUISITE COURSES: Engineering Mathematics, Analog Electronic Circuits.

COURSE DESCRIPTION AND OBJECTIVES:

This course introduces the theoretical and circuit aspects of op-amp, timer, which are the backbone for the basics of linear integrated circuits and to understand the various linear and non-linear applications of op-amp deals with fundamentals of number systems, boolean expressions which are used to realize combinational and sequential circuits with their logic families. Its objective is to introduce the concepts and techniques associated with the number systems and codes, to minimize the logical expressions using boolean postulates, to design various combinational and sequential circuits and to provide with a sufficient number of applications for the techniques and mathematics used in this course.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes	POs
1	Apply knowledge of digital circuit concepts to optimize a digital circuit.	1
2	Analyze the concepts of operational amplifiers, signal generators in realizing different circuits' models.	2
3	Conduct experiments using digital ICs to demonstrate a given application or problem statement.	4, 10
4	Design various configuration circuits as practical circuits and prototypes for different electronics and medical applications.	3, 5

SKILLS:

- ✓ *Minimize boolean expression.*
- ✓ *Construct different combinational circuits.*
- ✓ *Construct different sequential circuits.*
- ✓ *Verify the functionality of digital circuits.*

UNIT - I **L-9**

NUMBER SYSTEMS AND LOGIC GATES: Decimal, Binary, Octal and hexadecimal numbers, Conversion between these number systems, Binary coded decimal, Gray code, Binary to gray code conversion, ASCII code, Logic gates, Truth tables, NOT, AND, OR, NOR, NAND, XOR, XNOR, Boolean laws and theorems, Solving boolean expressions, Truth tables and logic circuits, The Karnaugh Map (upto four variables), Half adder, Half subtractor, Full adder, Full subtractor, Multiplexers and DE multiplexers, Decoders and encoders, Priority encoder.

UNIT - II **L-9**

REGISTERS AND COUNTERS: Basic memory element, Latch, Flip flops – RS, D, T, JK flip flops, JK master, Slave flip-flop, Shift registers, SISO, PIPO, SIPO and PISO, Universal shift register, Synchronous and asynchronous counters.

UNIT - III **L-9**

OPERATIONAL AMPLIFIERS: The ideal and practical op-amp characteristics of ideal operation, Slew rate, Offset voltage, Bias current, CMRR, Bandwidth, Equivalent circuit of an op-amp, Virtual ground concept, Linear applications of op-amp, Inverting and non-inverting amplifier, Summing, Subtracting, Averaging amplifier,Voltage to current converter, Differential amplifiers, Differentiator and integrator, Nonlinear applications, Comparator, Schmitt Triggers.

UNIT - IV **L-9**

ACTIVE FILTERS AND WAVE FORM GENERATOR: Active filters (first and second order), Low pass, High pass, Band pass filters, Band reject filters (notch filters), Waveform generators, Square, Triangular and saw tooth.

UNIT - V **L-9**

TIMER, PLL, A/D AND D/A CONVERTERS: 555 Timer (internal diagram) and its applications, Monostable multivibrator, Astable multivibrator; Phase locked loop (565 - block diagram approach) and its applications, Converters, Binary weighted DAC and R-2R DAC; ADC, Slope ADCs, Successive approximation ADC.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Verification of logic gates with truth tables.
2. Adders.
3. Subtractors.
4. Encoder, decoder.
5. Multiplexer and demultiplexer using digital ICs.
6. Opamp as inverting and non-inverting amplifier.
7. Opamp as integrator.
8. Opamp as differentiator.
9. Active filter – first order LPF and HPF.
10. 555 timer as a stable multivibrator and monostable multivibrator.
11. Binary weighted D/A converter.
12. Implementation of instrumentation amplifier using IC 741op-amp.

TEXT BOOKS:

1. M. Morris Mano, “Digital Logic and Computer design”, 1st edition, Prentice Hall 1994.
2. Kumar, A. Anand, “Switching Theory and Logic Design”, PHI Learning Pvt. Ltd., 2014.
3. Ramakant A. Gayakwad, “Op-amp and Linear Ics”, Prince Hall, 1994.

REFERENCE BOOKS:

1. Robert B.Northrop, “Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation”, 1st edition, CRC Press, 2004.
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 1st edition, McGraw-Hills, 2003.
3. Millman J and Halkias C. “Integrated Electronics”, 1st edition, TMH, 2007.
4. John. F. Wakerly, “Digital Design Principles and Practices”, 4th edition, Pearson Education,
5. Charles H. Roth, Jr, “Fundamentals of Logic Design”, 4th edition, Jaico Books, 2002.