ENGINEERING MATHEMATICS - III
(COMMON TO ALL BRANCHES)

Subject title	**:**	**Engineering Mathematics-III**
Subject code	**:**	**3X01**
Periods / week	**:**	**4**
Total Periods / Semester	**:**	**60**

Time Schedule with BLUEPRINT

S.No	Major Topic	No of Periods	Weightage of Marks	Short Type			Essay Type		
	Unit - I			R	U	App	R	U	App
1	Indefinite Integration	18	34	2	1	0	1	1	1/2
	Unit - II								
2	Definite Integration and its Applications	17	31	0	1	1	0	1	1 1/2
	Unit - III								
3	Differential Equations of first order	15	29	2	1	0	1/2	1/2	1
	Unit - IV								
4	Statistical Methods	10	16	1	1	0	1	0	0
	Total	**60**	**110**	**5**	**4**	**1**	**2 1/2**	**3 1/2**	**3**
	Marks			**15**	**12**	**3**	**25**	**25**	**30**

R: **Remembering**
U: **Understanding**
App: **Application**

Objectives

On completion of the subject the student shall be able to :

Unit-I

1.0 Use Indefinite Integration to solve engineering problems

1.1. Explain the concept of Indefinite integral as an anti-derivative.

1.2. State the indefinite integral of standard functions and properties of Integrals $\int (u + v)\, dx$ and $\int ku\, dx$ where k is constant and u, v are functions of x.

1.3. Solve integration problems involving standard functions using the above rules.

1.4. Evaluate integrals involving simple functions of the following type by the method of substitution.

i) $\int f(ax + b)\, dx$ where $f(x)\, dx$ is in standard form.

ii) $\int [f(x)]^n f'(x)\, dx$

iii) $\int f'(x)/[f(x)]\, dx$

iv) $\int f\{g(x)\}\, g'(x)\, dx$

1.5. Find the Integrals of *tan x, cot x, sec x* and *cosec x* using the above.

1.6. Evaluate the integrals of the form $\int Sin^m\theta\ Cos^n\theta.\, d\theta$ where m and n are positive integers.

1.7. Evaluate integrals of powers of *tan x* and *sec x*.

1.8. Evaluate the Standard Integrals of the functions of the type

$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$

$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$

$iii)\ \sqrt{x^2-a^2}, \sqrt{x^2+a^2}, \sqrt{a^2-x^2}$

1.9. Evaluate the integrals of the type

$$\int \frac{1}{a \pm bSin\theta} d\theta, \int \frac{1}{a \pm b\cos\theta} d\theta \text{ and } \int \frac{1}{a\cos\theta \pm b\sin\theta \pm c} d\theta .$$

1.10. Evaluate integrals using decomposition method.
1.11. Evaluate integrals using integration by parts with examples.
1.12 State the Bernoulli's rule for evaluating the integrals of the form $\int u.vdx$.
1.13. Evaluate the integrals of the form $\int e^x [f(x) + f'(x)]\, dx$.

Unit-II

2.0 Understand definite integral and use it in engineering applications
2.1. State the fundamental theorem of integral calculus
2.2. Explain the concept of definite integral.
2.3. Calculate the definite integral over an interval.
2.4. State various properties of definite integrals.
2.5. Evaluate simple problems on definite integrals using the above properties.
2.6. Explain definite integral as a limit of sum by considering an area.
2.7. Find the areas under plane curves and area enclosed between two curves using integration.
2.8. Obtain the volumes of solids of revolution.
2.9. Obtain the mean value and root mean square value of the functions in any given interval.
2.10. Explain the Trapezoidal rule, Simpson's 1/3 rules for approximation of integrals and provide some examples.

Unit –III

3.0 Solve Differential Equations in engineering problems.
3.1. Define a Differential equation, its order, degree
3.2 Form a differential equation by eliminating arbitrary constants.
3.3 Solve the first order first degree differential equations by the following methods:
- i. Variables Separable.
- ii Homogeneous Equations.
- iii. Exact Differential Equations
- iv. Linear differential equation of the form dy/dx + Py = Q, where P and Q are functions of x or constants.
- v. Bernoulli's Equation (Reducible to linear form.)

3.4 Solve simple problems leading to engineering applications

Unit -IV

4.0 Use Statistical Methods as a tool in data analysis.
4.1. Recall the measures of central tendency.
4.2 Explain the significance of measures of dispersion to determine the degree of heterogeneity of the data.
4.3 Find the measures of dispersion – range, quartile deviation, mean deviation, standard deviation for the given data.
4.4 Explain the merits and demerits of the above measures of dispersion.
4.5 Express relationship between measures of dispersion

4.6 Find the coefficient of variation
4.7 Explain bivariate data.
4.8 Explain the concept of correlation between two variables and co-varience.
4.9 Explain coefficient of correlation and its properties
4.10 Calculate the coefficient of correlation between two variables.
4.11 Find rank correlation co-efficient.

COURSE CONTENTS

Unit-I

Indefinite Integration.

1. Integration regarded as anti-derivative – Indefinite integral of standard functions. Peroperties of indefinite integral. Integration by substitution or change of variable. Integrals of the form $\sin^m\theta.\cos^n\theta$. where m and n are positive integers. Integrals of tan x, cot x, sec x, cosec x and powers of tan x, sec x by substitution. Evaluation of integrals which are reducible to the following forms :

$$i)\frac{1}{a^2+x^2},\frac{1}{a^2-x^2},\frac{1}{x^2-a^2}$$

$$ii)\frac{1}{\sqrt{a^2+x^2}},\frac{1}{\sqrt{a^2-x^2}},\frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\sqrt{x^2-a^2},\sqrt{x^2+a^2},\sqrt{a^2-x^2}$$

Integration by decomposition of the integrand into simple rational, algebric functions. Integration by parts , Bernoulli's rule.

Unit-II

Definite Integral and its applications:

2. Definite integral-fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum. Area under plane curves – Area enclosed between two curves. Volumes of solids of revolution. Mean and RMS values of a function on a given interval. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a define integral.

Unit -III

Differential Equations:

3. Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of first order, first degree: variable-separable, homogeneous, exact, linear differential equation, Bernoulli's equation.

Unit -IV

Statistical Methods

4. Revise measures of central tendency, measures of dispersion: range, quartile deviation, mean deviation, standard deviation for the given data, merits and demerits, relationship between measures of dispersion, coefficient of variation, bivariate data, concept of correlation, covariance, coefficient of correlation and its properties, rank correlation co-efficient.

Reference Books

1. Integral Calculus Vol.I, by M.Pillai and Shanti Narayan
2. Thomas' Calculus, Pearson Addison –Wesley Publishers
2. Statistical Methods Vol.I, Das, Tata McGraw-Hill
3. Statistics, 4/e, Schaum's Outline Series (SIE), McGraw-Hill

ELECTRONIC CIRCUITS
(COMMON TO ALL BRANCHES)

Subject Title : Electronic Circuits
Subject Code : 3X02
Periods per Week : 04
Periods per Semester : 60

TIME SCHEDULE WITH BLUE PRINT

S. No	Major Topics	Periods.	Weightage of Marks	Remember	Understanding	Applying	Analyzing	Short Type	Essay Type
1.	Small signal amplifiers	15	26	10	10	00	06	2	2
2.	Large signal Amplifiers	10	21	06	10	05	00	2	11/2
3.	Rf tuned Amplifiers	10	21	06	10	05	03	2	11/2
4.	Feedback Amplifiers	15	26	03	10	10	-	2	2
5	oscillators	10	16	03	10	03		2	1
	TOTAL	**60**	**110**	**50**	**36**	**09**	**15**	**10**	**8**

OBJECTIVES

1.0 Understand small signal amplifiers

1.1 Sketch the circuit of single stage RC coupled amplifier in CE mode with potential Divider type of biasing.
1.2 Indicate the purpose of each component in the above circuits.
1.3 Sketch the approximate AC equivalent circuit of RC coupled amp LF and Derive the approximate voltage gain.
1.4 Sketch the approximate AC equivalent circuit of RC coupled amp, MF &HF.
1.5 Sketch the frequency response curve for an RC coupled amplifier give reasons for the shape of the response.
1.6 Define Band Width, upper cut off frequency and lower cut off frequency.
1.7 Explain the working of CB amplifier circuit with input and output wave forms.
1.8 Give the middle frequency equivalent circuit
1.9 Explain the working of CC amplifier circuit with input and output waveforms
1.10 Give mid frequency equivalent circuit.
1.11 Sketch the FET common source amp circuit with self bias.
1.12 Indicate approximate AC equivalent circuit.
1.13 Explain the operation of above circuit with input and output wave shapes.
1.14 Sketch and explain two stage RC couple amp using BJT & FET
1.15 Derive the voltage gain for the above circuit.
1.16 Express the need of Direct coupled amplifier and explain with circuit diagram
1.17 Express the advantages and disadvantages of D.C. amplifiers.
1.18 Sketch the explain Darlington pair configuration.
1.19 Explain the advantages of Darlington configuration

2.0 Understand the working of AF amplifiers.

2.1. Distinguish between voltage amplifier and power amplifier.
2.2. Classify different power amplifiers based on operation.

2.3. Sketch the circuit of class- A single ended transistor power amplifier.
2.4. Explain the working of above amplifier with graphical analysis
2.5. Explain the need for output transformer in the above circuit.
2.6. Derive the expression for output power and efficiency of the above power amplifier.
2.7. Sketch and explain the class B push pull amplifier
2.8. Illustrate that even harmonics are eliminated in class B push-pull amplifier
2.9. Discuss the need of class-AB push-pull operation.
2.10. Sketch the circuits of a complementary push-pull power amplifier and explain its working.
2.11. Sketch and explain the phase splitter circuit.
2.12. List the applications of power amplifier.
2.13. List different IC numbers for power amplifiers.
2.14. Discuss the necessity of Heat sink for a power transistor and power I.C. device.
2.15. List the different types of heat sinks

3.0 Describe the function and performance of RF tuned voltage and power amplifier.
3.1 Explain the limitations of transistor at RF.
3.2 Sketch the circuit of single tuned and double tuned RF voltage amplifier.
3.3 Sketch the frequency response of the above amplifiers.
3.4 Express the Bandwidth in terms of resonant frequency and the qualify factor of tuned circuit.
3.5 Identify the important features of stagger tuned amplifiers by sketching its frequency response.
3.6 Compare the merits and demerits of single tuned , double tuned and stagger tuned amp's on the basis of Band width, gain tuning facility and applications.
3.7 Explain the need of neutralizing capacitor in the RF tuned voltage amplifier.
3.8 Explain the function of RF tuned power amplifier.
3.9 Explain the reason for selecting class C operation in the RF tuned power amplifier.
3.10 Sketch the basic circuit of class C power amplifier (using transistor)
3.11 Sketch the wave forms of input signal, collector current and output signal of above amplifier.
3.12 Indicate the expression for the tank circuit efficiency of tuned RF power amplifier.

4.0 Understand the Principles of Feedback in Amplifiers
4.1 Explain the basic concept of feedback in amplifiers
4.2 Explain the difference between positive feedback and negative feedback and list advantages and disadvantages
4.3 Define feedback factor Beta (β)
4.4 Derive the voltage gain of the negative feedback amplifiers in terms of gain of the same amplifier without feedback
4.5 Classify Different negative feedback amplifiers and draw their block diagrams
4.6 Illustrate the advantages of negative feedback amplifiers with specific reference to non - linear distortion, noise, stability and bandwidth.
4.7 Sketch the transistor circuits with voltage feedback and current feedback
4.8 Discuss the effect of negative feedback on voltage gain , current gain, input impedance and output impedance of the different negative feed back amplifier circuits

5.0 Understand the Working of Oscillator.
5.1. Define an electronic oscillator
5.2. Classify different oscillators on the basic of principle of operation, Waveform generation, and frequency and associated circuits parameters.
5.3. Explain the condition for an amplifier to oscillate.
5.4. Illustrate Barkhausen criterion for oscillators.
5.5. Illustrate the reasons for instability of oscillators.
5.6. Illustrate the remedies for Instability of oscillators
5.7. Sketch the circuits of RC phase shift and Wein bridge type audio oscillators.
5.8. give the expression for frequency of oscillations of the above circuits
5.9. Discuss the condition of sustained oscillations of the above oscillators

5.10. Compare the merits and demerits of RC phase shift and Wein bridge oscillators.
5.11. Sketch the circuits of Hartley, Collpitts, tuned collector and crystal oscillators (using Transistors)
5.12. Give the condition of sustained oscillations for the above oscillators
5.13. Give the expressions for frequency of oscillations for Hartley & Colpitts oscillators.
5.14. Construct and explain the oscillators using –ve resistance devices like Tunnel diode, UJT

COURSE CONTENTS

1. SMALL SIGNAL AMPLIFIERS

Working of single stage CE amplifier with BJT and FET at low frequencies and at high frequencies, working of common base, common collector and Darlington configuration, common source amplifier at low frequency, two stage RC coupled amp (BJT, FET) Direct coupled amp.

2. LARGE SIGNAL AMPLIFIER

Class A single ended, conditions for max power output, push pull amplifier (Class B) , elimination of even harmonics, phase inverter , complementary symmetry amplifier

3. RF TUNED VOLTAGE AND POWER AMPLIFIER

Single tuned, double tuned and stagger tuned amplifiers, applications - Tuned class C amplifier, Tank circuit efficiency, neutralizing capacitor.

4. FEED BACK AMPLIFIERS:

Basic concepts in feedback, voltage and current feedback ,effects of feedback, stabilization of gain, reduction of non linear distortion, decrease in noise, effect of feedback on input impedance and output impedance

4.0 OSCILLATORS.

Classification oft oscillators, low frequency oscillators- RC phase shift and Wein bridge, high frequency oscillators- Hartley, Collpitts, tuned collector and crystal, condition of sustained oscillations, expressions for frequency of oscillations of the above oscillators, oscillators using –ve resistance devices like Tunnel diode, UJT

REFERENCE BOOKS

1. Electronic device and circuits – Millman & Halkias.
2.. Electronic Devices and circuits - J.B Gupta
3. Basic Electronics and liner circuits by N. Bhargava, Kulshresta, S.C. Gupta
4. Principle of Electronics - Malvino
5. Electronic Fundamentals - David Bell

NETWORK ANALYSIS
(COMMON TO ALL BRANCHES)

Subject	**:**	**Network Analysis**
Subject Code	**:**	**3X03**
Periods per Week	**:**	**04**
Periods per Semester	**:**	**60**

TIME SCHEDULE WITH BLUE PRINT

SNo	Major topics	Periods	Weightage of Marks	Remembering	Understanding	Applying	Analysing	Short Type	Essay Type
1.	Resonance	12	26	3	8	5	-	2	2
2.	Mesh & Nodal analysis	18	29	3	3	15	5	3	2
3.	Network Theorems& Networks	18	29	6	8	10	5	3	2
4.	Filters ,Attenuators and Equalizers	12	26	3	8	10	5	2	2
	TOTAL	**60**	**110**	**15**	**30**	**40**	**15**	**10**	**8**

OBJECTIVES

1.0 Understand the resonance in A.C. Circuits.

1.1 Define resonance in RLC A.C. Circuits.
1.2 Derive the expression for resonant frequency, impedance and current at resonance of RLC series circuits.
1.3 Explain series resonance with the help of reactance curves.
1.4 Determine the bandwidth from the frequency response characteristics of series RLC circuit
1.5 Explain how the series resonance acts as a voltage magnifying circuit.
1.6 Explain the effect of resistance on selectivity and Band Width of series RLC circuit
1.7 Define the qualify factor of coil and capacitor
1.8 Calculate 'Q' from Band Width and resonant frequency.
1.9 Derive an expression for impedance of parallel RLC circuit at anti-resonant frequency.
1.10 Derive an expression for anti-resonance frequency of different parallel resonant circuits
1.11 Explain parallel resonance with the help of frequency response curves
1.12 Mention the Bandwidth expression of Parallel Resonant circuit
1.13 Derive the condition for anti-resonance for all frequencies when resistance is present in both inductance and capacitance branches.
1.14 Explain how the anti – resonant circuit act as a current magnifier circuit.
1.15 List the applications of resonant circuits.
1.16 Solve simple problems on series and parallel resonance circuits.
1.17 Compare the performance characteristics of series and parallel resonance circuits.

2.0 Analyze the networks by network analysis methods and network theorems

2.1 Explain ideal voltage source and ideal current source
2.2 List the methods of network analysis based on Kirchoff's laws.
2.3 Explain Mesh Analysis
2.4 List the advantages and limitations of Mesh Analysis.
2.5 Explain the method of selecting mesh currents in mesh analysis
2.6 Find the number of mesh currents required to solve the network
2.7 Write the mesh current equations for the given circuit and arrange them in matrix form
2.8 Analyze the networks by applying mesh current equations
2.9 Solve mesh current equations using Crammer's rule
2.8 write the mesh equations for coupled circuits using dot rule and solve
2.10 Give the concept of super mesh.

2.11 Define the driving point impedance and transfer impedance of a network
2.12 Calculate the driving point and transfer impedance for a given network.
2.13 Explain the Nodal Analysis.
2.14 Write node voltage equations for a given network and arrange them in matrix form .
2.15 Analyze the networks by applying node voltage equations
2.16 Give the concept of super Node
2.17 Define driving point admittance and transfer admittance of a network
2.17 Compute driving point and transfer admittances of a network.
2.18 Explain the principal of Duality
2.19 Sketch the dual of a given network.

3.0 Network Theorems and Networks

3.1 State Thevenin's, Norton's, Super position, Millmann's and maximum power transfer theorems
3.2 Apply the above theorems in solving problems.
3.3 Bring out the advantages and limitations of above theorems.
3.4 List different types of Networks
3.5 Distinguish between symmetrical and non-symmetrical networks.
3.6 Distinguish between balanced and unbalanced networks.
3.7 Define characteristic impedance and propagation constant of symmetrical network.
3.8 Derive an expression for Zo of symmetrical T network and mention the Zo expressions for symmetrical π network
3.9 Show that Zo = √Zoc Zsc .
3.10 Define Image and iterative impedances of asymmetrical network
3.11 Derive Image and iterative impedances of asymmetrical T network, and mention the Image and iterative impedances expressions for asymmetrical π and L networks

4.0 Understand the filters, attenuators and Equalizers

4.1 Define neper, decibel, characteristic impedance, propagation constant, Attenuation
4.2 Define filter, LPF, HPF, BPF, BEF.
4.3 Explain constant k filters
4.4 Give the expression for fc for constant k-LPF, HPF.
4.5 Design a simple constant-k LPF and HPF for a given cut-off frequency and nominal resistance
4.6 List the limitations of constant k filters
4.7 Explain the need of m-derived filter.
4.8 Explain the m-derived T-section.
4.9 Give the expression for fc for m-derived low pass filter and m-derived high pass filter
4.10 List the advantages of m-derived filters
4.11 Draw the block diagram of composite filter and explain.
4.12 Define Attenuator and draw different types of attenuators
4.13 Design a T-type attenuator for the given attenuation and characteristic impedance.
4.14 Mention the uses of Equilizers.
4.15 Classify the Equalizers
4.16 Draw the simple equalizer circuit and explain

COURSE CONTENTS

1 RESONANACE

Series and parallel resonance conditions for resonance, Q factor effect of resistance on Q Selectivity and band width uses of resonant circuits.

2 MESH & NODAL ANALYSIS

Mesh current analysis, Mesh equation solving Mesh Equation driving point impedance. Node voltage analysis, equation and solutions- Driving point admittance and duality.

3. NETWORK THEOREMS AND NETWORKS

Superposition theorem, Maximum power transfer theorem, Thevenin's and Norton's theorems, applications. Four terminal networks, T, II and L balance, unbalanced, symmetrical and Asymmetrical networks, open circuit impedance, short circuit impedance; characteristic impedance, propagation constant, compare between T and II networks.

4.0 FILTERS , ATTENUATORS AND EQUALIZERS

The decibel and Neper, simple configuration of different types of filters, LPF, HPF, BPF their attenuation and phase characteristics, m derived filters, composite filter, attenuators, equalizers.

TEXT BOOKS

1. Electric circuits by Joseph.a.Edminister (Schaum's outline series).

REFERENCE BOOKS

1. A course in Electrical Circuit Analysis by Sony & Gupta
2. Electric circuit Analysis by Wiilliam Hayt , Kemmerly
3. Network Analysis by Van Valkenberg

DIGITAL ELECTRONICS
(COMMON TO ALL BRANCHES)

Subject Title	**:**	**Digital Electronics**
Subject Code	**:**	**3X04**
Periods / Week	**:**	**4**
Periods / Year	**:**	**60**

TIME SCHEDULE

S No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	Number systems	8	13	1	1
2	Basics of Digital Electronics	12	26	2	2
3	Combinational logic Circuits	12	26	2	2
4	Flip – flops	18	19	3	1
5	Registers and Counters	10	26	2	2
	Total	**60**	**110**	**10**	**8**

OBJECTIVES

On completion of this unit the student shall be able to

1.0 Understand the basics of Number System

1.1 Give the outline of Positional Number Systems
1.2 Explain Binary, Octal, Hexadecimal number systems and compare with Decimal system.
1.3 Convert a given decimal number into Binary, Octal, Hexadecimal or to any number system and vice versa.
1.4 Convert a given binary number into decimal, octal , hexadecimal or to any number system and vice versa.
1.5 Perform binary addition, subtraction, Multiplication and Division.
1.6 Write 1's complement and 2's complement numbers for a given binary number.
1.7 Perform subtraction of binary numbers in 2's complement method.
1.8 Explain the use of weighted and Un-weighted codes.
1.9 Write Binary equivalent number for a number in 8421, Excess-3 and Gray Code and vice-versa.
1.10 Explain the use of alphanumeric codes (ASCII & EBCDIC)

2.0 Understand the basics of Digital Electronics

2.1 State different postulates in Boolean algebra.
2.2 Explain the basic logic gates AND, OR, NOT gates with truth table.
2.3 Explain the working of universal logic gates (NAND, NOR gates) using truth tables.
2.4 Explain the working of an exclusive – OR gate with truth table.
2.5 State and explain De-Morgan's theorems.
2.6 Write Boolean expressions for the given problem / truth table

2.7 Realize AND, OR, NOT operations using NAND, NOR gates.
2.8 Apply De-Morgan's theorems related postulates to simplify Boolean expressions
2.9 Explain standard representations for logical functions (SOP and POS form)
2.10 Write Boolean expressions from the given truth table.
2.11 Use Karnaugh map to simplify Boolean Expression with and without don't care conditions (up to 4 variables only)
2.12 Develop simplified logic circuits for a given problem (in statement form or truth table Form) using only NAND or NOR gates.

3.0 **Understand the working of combinational logic circuits**
3.1 Give the concept of combinational logic circuits.
3.2 Draw the Half adder circuit and verify its functionality using truth table.
3.3 Realize a Half-adder using NAND gates only and NOR gates only.
3.4 Draw the full adder circuit and explain its operation with truth table.
3.5 Realize full-adder using two Half-adders and an OR – gate and write truth table
3.6 Draw and explain a 4 Bit parallel adder using full – adders.
3.7 Draw and Explain 2's compliment parallel adder/ subtractor circuit.
3.8 Explain the working of a serial adder with a Block diagram.
3.9 Compare the performance of serial and parallel adder.
3.10 Draw and explain One & two bit digital comparator
3.11 Draw and explain the operation of different Multiplexers
3.12 Draw and explain the operation of different demultiplexer.
3.13 Draw and explain different decoder.
3.14 Draw and explain BCD to decimal decoder.
3.15 List any three applications of multiplexers and decoders.
3.16 Draw and explain Decimal to BCD encoder.
3.17 Construct various combinational circuits using multiplexers and decoders
3.18 Construct full adder using (3X8) decoders
3.19 Construct full adder using two (4X1) multiplexers
3.20 Problems on Boolean function implementation using basic gates, universal gates, decoders, multiplexers.
3.21 Design of 4 to 2 line priority encoder

4.0 Understand the working of Flip-flops
4.1 Give the concept of Sequential logic circuits.
4.2 Explain NAND and NOR latches with truth tables
4.3 State the necessity of clock
4.4 Explain the concept of level clocking and edge triggering,
4.5 Draw and explain clocked SR flip flop using NAND gates.
4.6 Explain synchronous and asynchronous inputs of flip-flips
4.7 Construct level clocked JK flip flop using S-R flip-flop and explain with truth table
4.8 Analyze the race around condition.
4.9 Draw and explain master slave JK flip flop.
4.10 Explain the level clocked D and T flip flops with the help of truth table and circuit diagram.
4.11 Know the truth tables of edge triggered D and T flip flops and draw their symbols.
4.12 Explain the symbol, characteristic equations, truth tables, excitation tables & the working of RS, T, D & JK flip-flops
4.13 List any four applications of flip flops.
4.14 Analyze the clocked sequential circuits using JK ,D & T flip flops with the help of state equations, state table and state diagrams

5.0 Understand working of Registers and memories
5.1 State the need for a Register
5.2 List the four types of registers.
5.3 Draw and explain the working of 4 bit shift left and shift right registers
5.4 Draw and explain the working of 4-bit bi-directional shift register.
5.5 Draw and explain parallel in parallel out shift register

5.6 Explain the working of Universal shift register (74194)
5.7 List the applications of shift registers.
5.8 Define modulus of a counter
5.9 Draw and explain 4-bit asynchronous counter with timing diagram.
5.10 Explain the limitations of ripple counters
5.11 Draw and explain asynchronous decade counter with timing diagram.
5.12 Draw and explain 4-bit synchronous counter with timing diagram.
5.13 Distinguish between synchronous and asynchronous counters.
5.14 Draw and explain 4 bit up-down counter with timing diagram.
5.15 Draw and explain the 4-bit ring counter circuit
5.16 List the applications of counters

COURSE CONTENT

1. Basics of Number Systems

Binary, Octal. Hexadecimal and any positional number systems. Conversion from one number system to another number system. Binary codes, excess-3 and gray codes.

2. Basics of Digital Electronics

Logic gates :AND, OR, NOT, NAND, NOR, Exclusive-OR. Logic symbols. Boolean algebra, Boolean expressions. Demorgan's Theorems. Implementation of logic expressions, SOP and POS forms, Karnaugh map application.

3. Combinational logic circuits

Implementation of arithmetic circuits, Half adder, Full adder, Serial and parallel Binary adder. Parallel adder/subtractor, Multiplexer, demultiplexer, decoder, encoder, tri-state buffer, 2-bit Digital comparator.

4. Flip- flops

Principle of flip-flops operation, Concept of edge triggering, level triggering, RS, D, JK, T, JK Master Slave flip-flops., synchronous and asynchronous inputs and their use. Applications of flip flops,.

5. Registers and counters

Shift Registers- Types, shift left ,shift right, bidirectional, Parallel in parallel out, universal shift registers, ring counter and its applications, Binary counter- ripple counter, synchronous counter, up-down counter, Ring counter.

REFERENCE BOOKS

1. Digital Design by Morris Mano, PHI Publications
2. Digital Computer Electronics by Malvino and leach., TMH
3. Digital Electronics Tokhem TMH
4. Digital Electronics Puri TMH
5. Digital Computer Fundamentals by Thomas Bartee.
6. Digital Electronics by GK Kharate, Oxford University Press.
7. Modern Digital Electronics By RP JAIN, TMH

COMMUNICATION AND DATA TRANSMISSION
(COMMON TO ALL BRANCHES EXCEPT CN BRANCH)

Subject Title : Communication and Data Transmission
Subject Code : 3X05
Periods / Week : 4
Periods / Year : 60

TIME SCHEDULE WITH BLUE PRINT

S No	Major Topics	No. of Periods	Weightage of Marks	Remembering	Understanding	Applying	Analysing	Short type	Essay type
1	Analog Modulation methods	20	29	13	9	..	4	3	2
2	Transmitters and receivers	15	26	10	10	8	-	2	2
3	Fundamentals of digital communication	10	29	12	8	7	-	3	2
4	Digital data modulation and demodulation	15	26	9	14	6	-	2	2
	Total	**60**	**110**	**44**	**41**	**21**	**4**	**10**	**08**

OBJECTIVES

1.0 Understand Analog modulation methods used in communication systems

1.1 Know the electromagnetic spectrum
1.2 Explain the need for modulation in communication system
1.3 Classify different modulation schemes
1.4 Explain AM with equation,
1.5 Explain SSB with equation
1.6 Define VSB
1.7 Sketch the waveforms of AM, SSB, VSB systems
1.8 Explain FM, PM with their waveforms and give equation.
1.9 State the need for pre emphasis and de emphasis in FM
1.10 State sampling theorem
1.11 List the types of pulse modulation methods with waveforms
1.12 Describe quantization process to obtain PCM signal
1.13 Explain about quantization noise in PCM and methods to reduce it
1.14 List the merits, demerits and applications of above modulation schemes

2.0 Transmitters and Receivers

2.1 Give the classification of radio transmitters
2.2 Explain the block diagram of AM transmitters
2.3 Explain about SSB transmitter with a block diagram
2.4 Explain the working principle of FM transmitters with AFC
2.5 Explain the working principle of indirect FM transmitters
2.6 Give the classification of radio receivers
2.7 Explain the working principle of super heterodyne receiver
2.8 Explain the working principle of FM receiver
2.9 Describe the working principle of PCM system with the aid of block diagram
2.10 State the purpose of an antenna
2.11 Explain the basic block diagram of satellite communication system
2.12 Describe the basic RADAR system
2.13 Explain the principle of Optical Fiber communication
2.14 Explain the Block Diagram of optical fiber communication system.

3.0 Understand the fundamentals of Digital communication

3.1 Explain the advantages and disadvantages of digital data transmission.

3.2 Types of Noise.
3.3 Explain SNR, noise figure, noise temperature and their importance
3.4 Explain the effect of noise on digital data communication system
3.5 Explain about error control
3.6 Explain error detection codes
3.7 Explain error correction codes in detail: ARQ, FEC, block codes
3.8 Define the terms average information, information rate and channel capacity
3.9 State the relation between information rate and channel capacity
3.10 List the advantages of digital transmission

4.0 Understand the Digital data modulation and demodulation methods
4.1 State the modes of signal transmission
4.2 State modes of data transfer
4.3 List the modulation techniques used in digital data transmission: ASK, FSK, PSK, DPSK, QPSK and QAM with waveforms
4.4 Describe the methods for generating and demodulating the following signals.
i) ASK ii) FSK iii) PSK iv) DPSK v) QPSK vi) QAM
4.5 Compare the above systems
4.5 Mention the need of multiplexing and types of multiplexing
4.6 Explain the principle of TDM and FDM
4.7 Explain the working principle of TDM with block diagram
4.8 Explain the working principle of statistical multiplexer with block diagram
4.9 Compare TDM and statistical multiplexing

COURSE CONTENTS

1. **Modulation methods:** Need for modulation in communication system. Elementary concepts of AM, FM,PM,PAM,PWM,PPM and PCM, mention of SSB and vestigial side bands, comparison and applications of above modulation schemes
2. **Transmitters, receivers :** Classification of Transmitters, A.M, SSB, F.M. block diagram of different transmitters and function of each block, Classification of receivers, receiver block diagram for reception of AM and FM signals. PCM system Fundamentals of antenna
   Basic block diagram of Satellite and radar systems. Optical fiber principle and optical fiber system.
3. **Fundamentals of Digital Communications :** Types of Noise, SNR, noise figure, Noise temperature with their importance, Effect of noise on digital data communication ,error control, error detection codes, error correction codes: ARQ, Hamming code, Block codes, Average information, information rate and channel capacity. Relation between information rate and channel capacity
4. **Digital data modulation and demodulation methods:** Modulation techniques used in digital data transmission like ASK, FSK, PSK, DPSK.QPSK, QAM with waveforms, Methods for generating and demodulating ASK, FSK, PSK, DPSK, QPSK, QAM and comparison of the above systems, multiplexing. Block diagram of TDM system and explanation Statistical multiplexing (concentrator) Block diagram and working principle, Compare the performance of the above systems.

Text Books
1. Electronic Communication Systems by George Kennedy
2. Electronic Communication Systems by WayneTomasi
Reference Books:
1. Electronic Communication Systems by Kennedy Davis
2. Data Communication and Networking by Behrouz Forouzen(3 rd edition)

ANALOG COMMUNICATIONS
(ONLY FOR CN BRANCH)

Subject Title	**:**	**ANALOG COMMUNICATIONS**
Subject Code	**:**	**3X05**
Periods/Week	**:**	**04**
Periods/Semester	**:**	**60**

. **TIME SCHEDULE**

Sl	Major topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Introduction to Communication System & Noise	10	19	3	1
2	Analog modulation techniques	15	26	2	2
3	AM transmitters and receivers	20	36	2	3
4	FM transmitters and receivers	15	29	3	2
Total		**60**	**110**	**10**	**8**

OBJECTIVES
On completion of the study of the subject a student should be able to comprehend the following:

1.0 Understand communication systems.
1.1 Describe the basic elements of a communication system with block diagram.
1.2 Explain Electromagnetic spectrum and mention the usage of frequencies for different applications
1.3 Define modulation
1.4 State the need for modulation in communication systems.
1.5 Define amplitude modulation and draw the wave form
1.6 Define Frequency modulation and draw the waveform
1.7 Define phase modulation
1.8 Distinguish between baseband, carrier, and modulated signals and give examples.
1.9 Explain the relationship between channel bandwidth, baseband bandwidth and transmission time.
1.10 List causes of distortion in transmission and measures for distortion less transmission.
1.11 Know the terms time domain and frequency domain.
1.12 List the types of noise
1.13 Describe internal and external Noise
1.14 Define signal to noise ratio, noise figure and noise temperature

2.0 Understand the principles of Analog Modulation Techniques
2.1 Derive the time-domain equation for an AM signal.
2.2 Define the modulation index of an AM signal.
2.3 Draw the frequency spectrum of an AM signal.
2.4 Describe the effects of over modulation.
2.5 Calculate the bandwidth of an AM signal.
2.6 Derive the relation between total power and carrier power in AM

2.7 Examples on current and power calculations.
2.8 Explain the need for DSBSC and SSB modulation
2.9 List the advantages and disadvantages of SSB
2.10 List applications of SSB.
2.11 Explain Vestigial side band transmission
2.12 State the need for angle modulation
2.13 List the two types of angle modulation
2.14 Derive the time domain equation for FM signal
2.15 Define the modulation index of an FM signal
2.16 Explain noise triangle in FM
2.17 Compare AM and FM
2.18 Compare FM and PM
2.19 Explain narrow band and wide band FM
2.20 Define pre-emphasis and de-emphasis
2.21 State the need for pre-emphasis and de-emphasis in FM

3.0 Understand AM transmitters and receivers.

3.1 List the requirements and specifications of transmitters.
3.2 Draw the block diagram for high level modulated transmitter and explain
3.3 Draw the low level modulated Transmitter and explain.
3.4 Distinguish between low level and high level modulation
3.5 Draw the block diagram of basic SSB transmitter and briefly explain.
3.6 Explain receiver parameters
3.7 Mention the need of RF amplifier
3.8 Explain the principle of TRF receivers and their disadvantages
3.9 State the need for heterodyning in receivers
3.10 Explain the block diagram of super heterodyne receiver and working of each stage
3.11 Explain the working of RF amplifiers circuits
3.12 Explain the working mixer/converter circuits
3.13 Explain local oscillator tracking
3.14 Define image frequency and IFRR
3.15 Explain adjacent channel interference and methods of elimination
3.16 Explain the choice of selecting correct IF
3.17 Explain the working of IF amplifier, detector and AF amplifier circuits
3.18 Explain the need for AGC and draw and explain simple AGC circuits and delayed AGC circuit.
3.19 Explain the need of squelch circuit and explain its working
3.20 Explain the working of communication receiver with its features
3.21 Explain demodulation techniques of SSB
3.22 Explain the block diagram of pilot carrier receiver with specification
3.23 Explain the working of suppressed carriers receiver with block diagram and give the important specification at each stage

4.0 Understand FM transmitters and receivers

4.1 Draw the block diagram of direct method of FM transmitter with AFC and explain its working.
4.2 LIST the various types of FM modulators and PM modulators
4.3 Explain about basic reactance and varactor diode modulator
4.4 Draw the block diagram of indirect FM transmitter and explain (Arm strong method).
4.5. Explain various types FM demodulators (Slope detector, Balanced slope detector, Foster Seeley discriminator, Ratio detector, Phase locked loop detector, Quadrature detector)
4.6 Compare above demodulators
4.7 Explain the working of FM receiver with block diagram
4.8 State the use of amplitude limiter and explain its operation
4.9 Explain the stereophonic FM multiplex system with block diagram

COURSE CONTENTS

1. **Introduction to communication system.**
   Elements of communication system, need for modulation, types of modulation, Noise, Signal to noise ratio, noise figure, noise temperature.

2. **Analog modulation techniques.**
   AM-Modulation index in AM, effects of over modulation, bandwidth, power and voltage of AM signal. DSBSC-SSB-VSB-advantages and disadvantages of angle modulation, Modulation index in FM, bandwidth, side bands, frequency deviation, pre-emphasis, de-emphasis

3. **AM Transmitters and Receivers.**
   Requirements and specifications of transmitters, low level modulated, high level modulated, SSB transmitter,. TRF receiver, super heterodyne receiver, selection of IF, AGC, sensitivity, selectivity, fidelity- IFRR, AM detector, pilot carrier receiver Suppressed carriers receiver

4. **FM Transmitters and Receivers**
   FM modulators and PM modulators ,FM transmitters, -FM detectors, FM receiver **,** FM multiplex system

REFERENCE BOOKS

1. Electronic communications systems by Roy Blake, Thomson Delmar
2. Electronic Communication System by George Kennedy.
3. Communication Electronics Frenzel TMH
4. Communication Systems By Simon Haykin-John Wiley
5. Modern analog and digital communications by B.P.Lathi –Oxford university press
6. Radio communication by G.K.Mithal- khanna publishers
7. Radio Engg by Terman- McGrawhill

UNIX & C
(COMMON TO ALL BRANCHES)

Subject title : UNIX & C
Subject Code : 3X06
Periods per Week : 04
Periods per Semester : 60

TIME SCHEDULE

Sl	Major Topics	No. of periods	Weightage of Marks	Short Answer Questions	Essay Questions
1	Unix operating system, VI editor	15	29	3	2
2	Introduction to C language	17	31	2	2 ½
3	Loops, Functions & Arrays	20	34	3	2½
4	Structures, Pointers, Files	08	16	2	1
	Total	**60**	**110**	**10**	**8**

OBJECTIVES
On completion of the study of the subject a student should be able to comprehend the following:

1.0 Understand basics of UNIX operating system and Vi editor
1.1 Explain operating system functions.
1.2 Explain the structure of UNIX OS.
1.3 Explain the functions of Kernel & Shell.
1.4 Explain the Architecture of Kernel.
1.5 Illustrate UNIX file system structure.
1.6 Explain file protection methods and use of chmod.
1.7 Describe file types in UNIX- ordinary, directory and device files .
1.8 Give directory commands like pwd, cd, ls, and ls with options, mkdir and rmdir.
1.9 Mention various file commands – cat, cp, rm, mv.
1.10 Explain the 3 modes in Vi editor: Input mode, last line mode and command mode.
1.11 Explain Input mode commands like append, insert, replace.
1.12 Explain how to save file and quit from Vi editor.
1.13 Describe about Navigation, paging, scrolling, moving between Lines, how to join lines, searching for a pattern and searching for a character.
1.14 Explain different operations on text such as deleting characters and lines.

2.0 Introduction to C language.
2.1 List the features of C language.
2.2 Give the structure of C program
2.3 Explain the sequence of execution of a program using flow chart.
2.4 Classify data types and explain them with examples.
2.5 Explain different arithmetic, assignment, increment, decrement operators, relational operators with their precedence, logical and bitwise operators..
2.6 Define an arithmetic expression and show how to evaluate it.
2.7 Explain the Nested assignments.
2.8 Explain the functions printf and scanf.
2.9 Know various type conversion techniques and discuss them.
2.10 State the importance of conditional expression operation.

2.11 List and explain the conditional statements in C - Simple if, nested if, if-else
2.12 Explain the use of Multi way conditional statements - else-if ladder, switch

3.0 Loops, functions and Arrays.

3.1 List the different iterative loops while, do-while, for and explain them.
3.2 Define nesting and implement it.
3.3 Differentiate break and continue statements.
3.4 Mention about null statements and comma operator.
3.5 Define a function.
3.6 State the use of return statement
3.7 Write programs using function call technique.
3.8 Discuss the importance of function prototypes in programming
3.9 Explain storage classes - auto, extern, static and register and discuss them in detail
3.10 Define Recursion and Explain with examples.
3.11 Define an Array.
3.12 Explain the method of accessing array contents and how to initialize an array.
3.13 Explain the use of array elements as arguments and arrays as arguments.
3.14 Define character array and array of strings.
3.15 Explain operations on Strings and String handling functions.

4.0 Structures, Pointers and file operations in C

4.1 Define a structure and explain about structure initialization.
4.2 Explain the method of structure members.
4.3 Explain how to find size of a structure.
4.4 Discuss nested structure concept.
4.5 Illustrate the relationship between structures and functions like structure as function arguments and structures as function values.
4.6 Illustrate the relationship between structures and arrays like arrays of structures, structures containing arrays, arrays of structures containing arrays.
4.7 Self referential structures, explain with examples.
4.8 Define a Union and explain use of a union.
4.9 Differentiate referencing and dereferencing operators.
4.10 Declare a pointer, assign a pointer, and initialize a pointer.
4.11 State the application of arithmetic pointer.
4.12 Precedence of referencing and de referencing operators.
4.13 Discuss pointer comparison and pointer conversion.
4.14 Know the dynamic memory allocating functions like malloc(), calloc().
4.15 Illustrate with example how pointer can be used to realize the effect of parameter passing by reference.(call by address)
4.16 Illustrate with examples the relationship between arrays and pointers.
4.17 Discuss pointer arrays with example.
4.18 Describe concept of pointers to functions.
4.19 Explain concept of pointer to structure.
4.20 Illustrate concept of structures containing pointers.
4.21 Describe the need of files
4.22 Explain the functions relating the file operations
4.23 1) fopen() 2) fclose() 3) fscanf() 4) fprintf() 5) feof() 6) ftell() 7) fseek() 8) rewind()

COURSE CONTENTS

1 **Understand basics of UNIX operating system and Vi editor**

Structure of UNIX O.S-functions of Kernel & Shell- Architecture of Kernel- file sub system -UNIX file system structure.-file protection methods-various file commands – cat, chmod, cp, rm, mv.-Give directory commands like pwd, cd, ls, and ls with options, mkdir and rmdir-List various editors in UNIX-3 modes in Vi editor Input mode, last line mode and

command mode. Know Input mode commands like append, insert, replace-save file and quit from Vi editor-deletion. Navigation, paging, scrolling, moving between a line searching in a pattern, searching for a character-delete, change.

2. Introduction to C language.

data types- Arithmetic ,assignment ,increment, decrement operators- relational operators-precedence, logical and bitwise operators-arithmetic expression-Nested assignments-printf and scanf- type conversion-conditional expression- Multi way conditional-Switch statements.

3. Loops, functions and Arrays.

Loops while, do-while, for - break and continue statements, function-return statement-function call-prototypes-local and external-automatic and static variables- external of declaration-Recursion- initialize an array-string array-string handling functions

4. Structures, Pointers and file operations in C

Structure initialization-structure members-find size of a structure-nested structure- pointer to structure-Union-pointer, assign a pointer, initialize a pointer-application of arithmetic pointer-pointer conversion.-dynamic memory - malloc(), calloc()- files- fopen()- fclose() - fscanf() - fprintf() - feof() - ftell()-fseek()-rewind()

TEXT BOOKS

1. UNIX Concepts & Application- Sumithabha Das
2. Programming in ANSI C – E.Balaguruswamy

REFERENCE BOOKS

1. Spirit of C - Cooper
2. Let us C – Yashwant Kanetkar

ELECTRONIC CIRCUITS AND NETWORKS LAB PRACTICE
(COMMON TO ALL BRANCHES)

Subject title : Electronic Circuits and Network Lab Practice
Subject code : 3X07
Periods per week : 6
Periods / Semester : 90

List of Experiments:

S. No.	Major Topics	No. of Periods
	Part A	
1	Transistor Amplifiers	9
2.	Negative feedback amplifiers	12
3.	Class A,B,C amplifiers	12
4.	Oscillators	12
	Part B	
5	Using Electronic measuring equipment and resonance	12
6	verification of Network theorems	12
7	networks	9
8	Filters and Attenuators	12
	Total	**90**

List of Experiments

PART A

1. Plot the frequency response characteristics of a RC coupled Amplifier.
   a) Calculate the gain, f1, f2 and band width from the response. Observe the effect of connecting and disconnecting the emitter bypass capacitor on gain, and distortion.
   b) Measure the voltage across Emitter Resistance using CRO, with and without emitter bypass capacitor Ce
   c) Measuring the output power using ac power meter
2. Measure the effective Beta for the Darlington pair
3. Plot the frequency response characteristics of negative feedback Amplifier.
   a)Calculate the gain, f1, f2 and band width from the response.
   b) Observe the effect of feedback on gain, f1, f2 and band width for voltage series ,current shunt, voltage shunt ,current series feedback
4. To determine the effective current gain of a Darlington Pair
   a) Connect two BC148 transistors in a Darlington pair and calculate the effective Beta
5. To determine the efficiency of class A, B C amplifier
6. To observe the output of a tuned circuit oscillator and identify the osillator type from the components in the circuit
   a) Colpitt's oscillator and Hartley oscillator
   b) crystal oscillator circuit

PART B

1. To measure the component values(R,L,C) using LCR meter
2. To plot resonant curves of a tuned circuit
   a) Series Resonance., b) Parallel Resonance.
3. Verification of Network theorems-I
   a) Thevinen's theorem. b) Nortons theorem
4. Verification of Network theorems-II
   c) Super position theorem. d) Maximum power transfer theorem.

5. To Measure Zo of Symmetrical T and π networks
6 Design and implement a constant-K Low pass filter with a cut off frequency of 10 KHz(or any other frequency) and evaluate the performance
7. Design and implement a constant-K High pass filter with a cut off frequency of 10 KHz(or any other frequency) and evaluate the performance
8. Design and Realize T-type Attenuator circuit and determine the actual attenuation

Objectives and Key Competencies

Exp NO	Name of the Experiment	Objectives	Key Competencies
		PART A	
1	Frequency response characteristics of a RC coupled Amplifier.	1.Assemble the circuit as per the circuit diagram 2. Identify the coupling and bypass capacitors(types, values) 3.Observe the effect of connecting and disconnecting the emitter bypass capacitor on gain, and distortion. 4. Measure the voltage across load using CRO by varying frequency 5 Measure the voltage across Emitter Resistance using CRO, with and without emitter bypass capacitor Ce 6) Measuring the output power using ac power meter by varying frequency 7 draw the frequency response characteristics of a RC coupled Amplifier on semi log graph sheet.	1 Calculating the gain in db 2.Plot the frequency response characteristics of a RC coupled Amplifier on semi log graph sheet and also on normal graph sheet. 2. Calculate the 3db points, f1, f2 and band width from the response. 3. Observing the distortion(clipping) **of** signal on CRO and adjusting the input for distortionless output
2	Darlington pair	1.Connect two BC148 transistors in a Darlington pair and calculate the effective Beta 2. Find out the device specifications of TIP 120 from the data sheets and compare the h_{fe} with that of BD 139. 3.Connect Darlington Pair circuit 5. . Measure the voltage across load using CRO by varying frequency 4. Calculating the Effective Beta from individual Betas of the transistors	1.Measure the voltage across load using CRO 2.Calculating the Effective Beta from individual Betas of the transistors
3.	Frequency response characteristics of negative feedback Amplifier.	1.Assemble the circuit as per the circuit diagram 2. . Measure the voltage across load using CRO by varying frequency 3. Measure the output voltage across load using CRO, with and without feedback by varying frequency 4.Calculating the gain in db 5. Draw the frequency response characteristics of a negative feedback Amplifier on semi log graph sheet.	1.CalculatE the gain in db 2.Draw the frequency response characteristics of a negative feedback Amplifier 3. Calculate band width 4. Compare the bandwidth and gain with and without

		6.Calculate band width 7. Compare the responses with and without feed back	feed back
4.	Tuned circuit oscillators	1. Assemble the circuit as per the circuit diagram 2.Identifying Tuned circuit and feed back circuit 3. Observing the waveforms on CRO 4. Observe the effect of varying the core of inductor	1 observe the output of a tuned circuit oscillator and identify the type from the components in the circuit 2. Observe the waveforms on CRO 3. Calculate frequency of oscillations
5	Colpitt's oscillator Hartley oscillator crystal oscillator	1.Assemble the circuit as per the circuit diagram 2. Identify the type of circuit and feed back circuit 3. Observing the waveforms on CRO 4. Observe the effect of varying the core of inductor or capacitor	1 observe the output of a oscillator and identify the type from the components in the circuit 2. Observe the waveforms on CRO 3. Calculate frequency of oscillations
6	Class A,B,C amplifiers	1.Assemble the circuit as per the circuit diagram 2. Identify the type of operation by adjusting base bias 3.Observeoutput waveforms on CRO for class A,B,C amplifiers 4. Measure the output voltage across load 5.Calculate efficiency	1. identify the type of operation by adjusting base bias 2. Observe output waveforms on CRO for class A,B,C amplifiers 3. Calculate efficiency

PART B

Exp No	Name of the Experiment	Objectives	Key competencies
1.	Measurement of the component values using special equipment a) Use of Digital LCR meter to measure RLC & Q	a) To identify the RLC Digital RLC meter and note the front panel controls. b) Measure component values by selecting the proper mode and range	a)Identify RLC meters b) Using the digital RLC meter
2.	Resonance curves of a tuned circuit a)Series Resonance., b)Parallel Resonance.	a) To identify the TUNED circuit components b) connect L and C to form a series and parallel resonant circuit c) Plot the resonant curves d) Calculate the resonant frequency and BW and verify with measured values e) compare series and parallel resonances	a) performing the experiment as per procedure b) Observe that the resonant circuit acts as a frequency selector and magnifier.
3.	Verification of Network theorems-I a) Thevinen's theorem.	To Verify above Network theorems. Estimate the voltages &currents in a circuit element when multiple sources are involved Understand the importance of Thevenins impedance and applying the knowledge in analogue circuits Reinforce the skills of using	Perform the experiment as per procedure and analyze the reasons for errors Correlate the Experimental knowledge in the Electronic circuits.

	b) Nortons theorem	Voltmeters and Ammeters Connecting the Components as per the circuit Follow the sequence of procedure	
4	Verification of Network theorems-II a)Verification of Super position theorem. b) Verification of Maximum power transfer theorem	To Verify above Network theorems. Estimate the voltages &currents when multiple sources are involved Understand the importance of impedance matching and applying the knowledge in analogue circuits Reinforce the skills of using Voltmeters and Ammeters Connecting the Components as per the circuit Follow the sequence of procedure	Perform the experiment as per procedure and analyze the reasons for errors Correlate the Experimental knowledge in the Electronic circuits
5	Measurement of Zo of Symmetrical T and π networks	a)To identify the Symmetrical T and π networks b)Measure Zo of symmetrical T and π networks	Know the formulas for Zo of symmetrical T and π networks
6	Design and implement a Low pass filter with a cut off frequency of 10 KHz(or any other frequency) and evaluate the performance	To Know the purpose of filters and Types Know the formulas for Filter Design Know the specifications of Filters To understand the filter design Evaluate the performance of constant k filters (observe the limitations) Observe and locate 3db points on the response curve	Know the formulas for Filter Design Designing Constant K filters for a given cut off frequency
7	Design and implement a High pass filter with a cut off frequency of 10 KHz(or any other frequency) and evaluate the performance	To Know the purpose of filters and Types Know the formulas for Filter Design Know the specifications of Filters To understand the filter design Evaluate the performance of constant k filters (observe the limitations) Observe and locate 3db points on the response curve	Know the formulas for Filter Design Designing Constant K filters for a given cut off frequency
8.	Design and Realize T- type Attenuator circui and determine the actual attenuation	Know the Function of Attenuator Know the formulas used for attenuator design (impedance matching criterion) Know the specifications of attenuator Using dB measurements/ calculations Implementing attenuator and evaluating performance	Designing attenuator with required specifications and evaluation

DIGITAL ELECTRONICS LAB PRACTICE
(COMMON TO ALL BRANCHES)

Subject Title : Digital Electronics Lab Practice
Subject Code : 3X08
Periods/Week : 04
Periods/Semester : 60

S. No.	Major Topics	No. of Periods
I.	Basic Gates	12
II.	Arithmetic & Logical Circuits	8
III.	Combinational Logic Circuits	16
IV.	Latches & Flip flops	8
V.	Counters	8
VI	Registers	8
		60

LIST OF EXPERIMENTS

1. Identification of Digital ICs and noting down pin details from data sheets
a) Identify the given digital ICs and draw the pin diagrams. (use TTL and CMOS ICs of AND, OR,NOT, NAND, NOR and XOR gates with two and three inputs)
b) Realize basic gate functions using toggle switches and a bulb

2. Verify the truth tables of AND, OR,NOT, NAND, NOR and XOR Gates
a) Verify the Functionality of Different logic gates and Write the corresponding truth table
b) Measure threshold voltages resulting in change of a state of a NAND gate
c) Verify the truth table of 7403 IC and give your observations

3. Realize AND , OR , NOT , XOR functions using 2 input NAND and NOR TTL Gates
a) From the data sheets find out CMOS Equivalent of above ICs
b) Implement a 4bit complement generator using 7486 quad XOR IC
c) Realize a simple comparator using XOR Gate
d) Realize a NOT gate using XOR gate

4. Arithematic & Logical Circuits
Implement Half adder, Half Subtractor, full adder and full Subtractor circuits using TTL gates and verify the truth tables.

5 . To study the Features of 74138 Decoder IC
a) Verify the function of 74138 decoder IC.
b) Combine two 3 to 8 decoder to realize a 4 to 16 Decoder

6 . To study the Features of 74148 Encoder IC
a) Verify the function of 74148 Encoder
b) Combine two 74148 Encoder

7. To Verify the Functions of Multiplexer and De multiplexers (Using IC 74153&IC 74154)
a) Understand the function of Multiplexer and demultiplexer
b) Implement the given function using IC 74153 and 74154
c) Combine two Multiplexers

8. To Verify the function of 4-bit magnitude comparator 7485IC.

a) Verify the effect of giving different logic inputs to pins 2,3,4 of IC
b) Realize a simple 2bit comparator using XOR Gate

9. To Construct and verify the truth tables of NAND & NOR latches

a) Realize a Bistable element with two NOT gates and a Feedback Resistor
b) Implement a bounce Elimination switch using the above Gates

10. To Construct clocked RS FF using NAND gates and Verify its truth table.

a)Verify the truth table of CD 4013 Dual D flip Flop
b)Verify the functionality and truth table of 74L71 RS flip flop with Preset and Clear
c) Verify the Truth table of JK FF using 7476 IC.
d) Construct D and T flip flops using 7476 and verify the truth tables.
e) Verify the function of octal latch 74LS373

11.To Construct and verify the function of decade counter using 7490 ICs.

a) change the modulus of the counter
b) display decimal number using 7447
c) From data sheets Findout other Types of counter ICs available and their Pin configuration

12. To Verify the function of up/down counter using 74190, 74193

a) change the modulus of the counter and verify
b) Verify the Functionality of CD4029 up/down counter
c) Use the Preset inputs of CD4029 Counter

13.To Verify the function of Johnson counter using CD 4017 IC

a) Change the modulus of the counter
b) Design a Frequency divider circuit using 4017 IC
c) Implement running LED circuit with 4017 IC

14. To Verify the function of shift register (ICs like 7495, 74194 etc.)

Expt. No.	Experiment Name	Objectives	Key Competencies
I.	Basic Gates	a) Identify the given digital ICs and draw the pin diagrams. (use TTL and CMOS ICs of AND, OR,NOT, NAND, NOR and XOR gates with two and three inputs) b) Realize basic gate functions using toggle switches and a bulb c) Verify the Functionality of Different logic gates and Write th corresponding truth table d) Measure threshold voltages resulting in change of a state of a NAND gate e) Verify the truth table of 7403 IC and give your observations f) From the data sheets find out CMOS Equivalent of above ICs g) Implement a 4bit	1. Able to identify the IC nos. 2. Able to connect ICs on breadboards 3. Able to observe the functions of all basic gates with their truth tables.

		complement generator using 7486 quad XOR IC h) Realize a simple comparator using XOR Gate i) Realize a NOT gate using XOR gate	
II.	Arithmetic & Logical Circuits	Implement Half adder, Half Subtractor, full adder and full Subtractor circuits using TTL gates and verify the truth tables	1.Able to identify the appropriate kit 2. Able to identify the available ICs on the kit for each experiment 3. Able to read the connections 4. Able to observe the functionality of the circuit with truth table.
III.	COMBINATIONAL LOGIC CIRCUITS	a) Verify the function of 74138 decoder IC. b) Combine two 3 to 8 decoder to realize a 4 to 16 Decoder c) Verify the function of 74148 Encoder d) Combine two 74148 Encoder e) Understand the function of Multiplexer and demultiplexer f) Implement the given function using IC 74153 and 74154 g) Combine two Multiplexers h) Verify the effect of giving different logic inputs to pins 2,3,4 of IC i) Realize a simple 2bit comparator using XOR Gate	1.Able to identify the appropriate kit 2. Able to identify the available ICs on the kit for each experiment 3. Able to read the connections 4. Able to observe the functionality of the circuit with truth table.
IV.	LATCHES & FLIP FLOPS	a) Realize a Bistable element with two NOT gates and a Feedback Resistor b) Implement a bounce Elimination switch using the above Gates c)Verify the truth table of CD 4013 Dual D flip Flop d)Verify the functionality and truth table of 74L71 RS flip flop with Preset and Clear e) Verify the Truth table of JK FF using 7476 IC. f) Construct D and T flip flops using 7476 and verify the truth tables. g) Verify the function of octal latch 74LS373	1.Able to identify the appropriate kit 2. Able to identify the available ICs on the kit for each experiment 3. Able to read the connections 4. Able to observe the functionality of the circuit with truth table.
V.	COUNTERS	a) change the modulus of the counter b) display decimal number using 7447 c) From data sheets Findout	1.Able to identify the appropriate kit 2. Able to identify the available ICs on the kit for each experiment

		other Types of counter ICs available and their Pin configuration d) change the modulus of the counter and verify e) Verify the Functionality of CD4029 up/down counter f) Use the Preset inputs of CD4029 Counter g) Change the modulus of the counter h) Design a Frequency divider circuit using 4017 IC i) Implement running LED circuit with 4017 IC	3. Able to read the connections 4. Able to observe the functionality of the circuit with truth table.
VI	SHIFT REGISTERS	a)Identification of ICs like 7495, 74194 b)Verify the functionality of the above ICs	1.Able to identify the appropriate kit 2. Able to identify the available ICs on the kit for each experiment 3. Able to read the connections 4. Able to observe the functionality of the circuit with truth table.

COMMUNICATION & DATA TRANSMISSON LAB PRACTICE
(COMMON TO ALL BRANCHES EXCEPT CP & IE)

Subject Title : Communication & Data Transmission Lab Practice
Subject Code : 3X09
Hours/Week : 04
Hours/Semester: 60

List of Experiments:

ANALOG MODULATION

1 Simple method Generation of AM and detection
2 Simple method Generation of FM and detection
3 Generation of DSBSC/SSB and detection
4 To study AM transmitter and Receiver
5 To study FM transmitter and Receiver

DIGITAL MODULATION

4 Generation and detection of PAM
5 Pulse code modulation and Demodulation
6 Pulse width modulation and Demodulation
7 Generation and detection of FSK
8 Generation and detection of PSK
9 Generation and detection of DPSK
10 Generation and detection of QPSK
11 Study of TDM and observe the output waveform
12 Observe the effect of noise on analog system

S. No	NAME OF THE EXPERIMENT	OBJECTIVES	KEY COMPETENCIES
		ANALOG MODULATION	
1	Simple method Generation of AM and detection	1. observing carrier and modulating signal 2. observing circuit components 3. observing AM modulated signal 4. observing demodulated circuit 5. observing output of demodulated circuit 6. Observing the different sections in the circuit	To perform the experiment as per procedure and calculate modulation index.

2	Simple method Generation of FM and detection	1. Measuring the amplitude and frequency of carrier and modulating signals 2. Observing the frequency deviation 3. Observing different blocks 4. Observing demodulated signal and comparing with original modulation signal.	• To perform the experiment as per procedure • Identifying frequency modulated signal • Measuring frequency deviation and calculating modulation index.
3	Generation of DSBSC/SSB and detection	1. 1.observing suppression of carrier 2. observing one side band (after suppression of carrier) 3. observing the balanced modulator circuit.	To perform the experiment as per procedure Identifying the a) Modulating signal b) Output waveforms before filtering c) Output waveforms after filtering
4	To study AM transmitter and Receiver	1. To identify the various blocks in transmitter and receiver	To perform the experiment as per procedure To draw the output waveforms at output of each block
5	To study FM transmitter and Receiver	1. To identify the various blocks in transmitter and receiver	To perform the experiment as per procedure To draw the output waveforms at output of each block
DIGITAL MODULATION			
6	Generation and detection of PAM	1. To understand the process of PAM 2. To pulse amplitude modulate the input sinusoidal signal. 3. To observe the waveforms on CRO. 4. To demodulate PAM signal and to recover original signal.	To perform the experiment as per procedure To identify PAM signal
7	Pulse code modulation and Demodulation	1.To understand the process of PCM 2.To know the process of Quantization by experimental verification 3.To observe the input and output waveforms on CRO. 4.Observing the effect of quantization on CRO. 5.To identify different sections in PCM decoder.	To perform the experiment as per procedure Identifying the quantization signal. Drawing input and output waveforms.

8	Pulse width modulation and Demodulation	1. To understand the process of PWM 2. To know the process of PWM through experiment 3. To PW modulate input signal 4. To demodulate the PWM signal and recover the modulating signal 5. To identify the various sections in the circuit	To perform the experiment as per procedure, analyzing, observing and drawing input and output waveforms.
9	Generation and detection of FSK	1.To know the process of FSK by experiment 2.To transmit data using FSK 3.To identify various sections in the circuit	To perform the experiment as per procedure, analyzing, and observing waveforms.
10	Generation and detection of PSK	1. To know the process of PSK by experiment 2. To transmit data using PSK 3. To identify various sections in the circuit	To perform the experiment as per procedure, analyzing, and observing waveforms.
11	Generation and detection of DPSK	1. To identify various components in DBPSK transmitter 2. To identify various components in BPSK modulator 3. To identify various components in DBPSK receiver	To perform the experiment as per procedure To note the outputs of DBPSK modulator and receiver
12	Generation and detection of QPSK	To identify various components in QPSK circuit	• To perform the experiment as per procedure • To note the outputs of QPSK modulator and receiver
13	Study of TDM and observe the output waveform	1. Compare head process of TDM by experiment 2. to transmit 4 signals of sinewave 250Hz, 500Hz,1KHz,2KHz using TDM 3. To identify various sections in TDM 4. Demultiplex TDM signal and observe the waveform	To perform the experiment as per procedure
14	Observe the effect of noise on analog system	1. Calculate noise figure	To perform the experiment as per procedure

COMMUNICATION & DATA TRANSMISSON AND MATLAB PRACTICE
(ONLY FOR CP & IE BRANCHES)

Subject Title : COMMUNICATION & DATA TRANSMISSON AND MATLAB PRACTICE

Subject Code : 3X09
Hours/Week : 04
Hours/Semester: 60

List of Experiments:

ANALOG MODULATION

1. Simple method Generation of AM and detection
2. Simple method Generation of FM and detection
3. Generation of DSBSC/SSB and detection
4. To study AM transmitter and Receiver
5. To study FM transmitter and Receiver

DIGITAL MODULATION

6. Generation and detection of PAM
7. Pulse code modulation and Demodulation
8. Pulse width modulation and Demodulation

S. No	NAME OF THE EXPERIMENT	OBJECTIVES	KEY COMPETENCIES
	ANALOG MODULATION		
1	Simple method Generation of AM and detection	7. observing carrier and modulating signal 8. observing circuit components 9. observing AM modulated signal 10. observing demodulated circuit 11. observing output of demodulated circuit 12. Observing the different sections in the circuit	To perform the experiment as per procedure and calculate modulation index.
2	Simple method Generation of FM and detection	5. Measuring the amplitude and frequency of carrier and modulating signals 6. Observing the frequency deviation 7. Observing different blocks 8. Observing demodulated signal and comparing with original modulation signal.	• To perform the experiment as per procedure • Identifying frequency modulated signal • Measuring frequency deviation and calculating modulation index.
3	Generation of	4. 1.observing suppression of carrier	To perform the experiment as per procedure

	DSBSC/SSB and detection	5. observing one side band (after suppression of carrier) 6. observing the balanced modulator circuit.	Identifying the d) Modulating signal e) Output waveforms before filtering f) Output waveforms after filtering
4	To study AM transmitter and Receiver	2. To identify the various blocks in transmitter and receiver	To perform the experiment as per procedure To draw the output waveforms at output of each block
5	To study FM transmitter and Receiver	2. To identify the various blocks in transmitter and receiver	To perform the experiment as per procedure To draw the output waveforms at output of each block
DIGITAL MODULATION			
6	Generation and detection of PAM	5. To understand the process of PAM 6. To pulse amplitude modulate the input sinusoidal signal. 7. To observe the waveforms on CRO. 8. To demodulate PAM signal and to recover original signal.	To perform the experiment as per procedure To identify PAM signal
7	Pulse code modulation and Demodulation	6.To understand the process of PCM 7.To know the process of Quantization by experimental verification 8.To observe the input and output waveforms on CRO. 9.Observing the effect of quantization on CRO. 10. To identify different sections in PCM decoder.	To perform the experiment as per procedure Identifying the quantization signal. Drawing input and output waveforms.
8	Pulse width modulation and Demodulation	6. To understand the process of PWM 7. To know the process of PWM through experiment 8. To PW modulate input signal 9. To demodulate the PWM signal and recover the modulating signal 10. To identify the various sections in the circuit	To perform the experiment as per procedure, analyzing, observing and drawing input and output waveforms.

MAT LAB PRACTICE

1. Compute the following quantities
   a. $\frac{2^5}{2^5-1}$
   b. $\sin\frac{\pi}{6}, \quad \cos\pi$
   c. $\frac{1+3i}{1-3i}$

2. The equation of a straight line is y=mx+c, where m and C are constants. Compute the y-coordinates of a line with slope m=0.5 and the intercept c =-2 at the following co-ordinates: X=0, 1.5, 3, 4, 5, 7, 9 and 10

3. Create a column vector for θ with values $0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \pi \ and \ \frac{5\pi}{4}$. Take r=2 and compute the column vectors x and y.

4. Plot $y = \sin x, 0 \leq x \leq 2\pi,$ taking 100 linearly spaced points in the given interval. Label the axes and put “Plot created your name” in the title.

5. Write a script file that when executed, greets you, displays the date and time

6. Write a function to calculate factorial of a given number. Enter the following matrices.
   $A = \begin{bmatrix} 2 & 6 \\ 3 & 9 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$
   Compute a) A+B b) B+A c) A*B

7. An exercise to import data from a JPEG file and reconstruct the image.

8. Plot simple graphs using fplot()

9. Plot simple graphs using ezplot()

10. Solve the following linear equations using MATLAB
    5x-3y+2z=10
    -3x+8y+4z=20
    2x+4y-9z=9

Exp No	Name of the Experiment	Objectives	Key Competencies
1	Getting started with MATLAB	To Know about the lab	Identify the starting and Quitting into Matlab
2	Working With Matrices	To work with Matrices	Can able to work with Matrices and Arrays
3	Working With Mathematical Expressions	To work with variables, numbers, operators & functions	Able to know the work with Mathematical functions
4	Loading the Data	To use the Load Command	Able to use the data
5	Plot simple graphs using fplot()	Plot the simple Graphs	Able to Plot the simple Graphs,labeling & Naming the Axes
6	Plot simple graphs using ezplot()	Plot the simple Graphs	Able to Plot the simple Graphs, labeling &Naming the Axes between the limits and can learn to plot for Expressions also
7	Plot the Unit impulse, Unit Step and ramp signals and lable them	To Plot the Unit impulse, Unit Step and Ramp signals	Able to Plot the signals and know the differences
8	Sampling of a Signal	To Know the Sampling ,Nyquist rate of sampling	Able to know the sampling, Nyquist rate of sampling,Over sampling and their effects
9	Gain Experience with MATLAB tools	Using the Tool Matlab boxes	Able to know how to use different tool boxes
10	Convolution of two given signals & sequences	Find the Convolution of two given signals and plot them	Able to know the Convolution of two given signals and resultant plot & able to correlate the results with theory

Reference Books: Getting started with MATLAB by Rudra Pratap, Oxford university Press

UNIX & C Lab Practice
(COMMON TO ALL BRANCHES)

Subject Title : UNIX & C Lab Practice
Subject Code : 3X10
Hours/Week : 04
Hours/Semester: 60

LIST OF EXPERIMENTS

At end of this lab practice, the student shall be able to perform

1. Editing, compiling and executing programs
2. Exercises on printf and scanf functions
3. Exercises on Selective Structures
4. Exercises on Repetitive Structures
5. Exercises on functions to demonstrate prototyping, parameter passing, function returning values.
6. Exercises on recursion
7. Exercises on global variables.
8. Exercises on arrays and Strings
9. Exercises to demonstrate use of Pointers, pointers as function arguments, functions returning pointers
10. Exercise on structures.
11. Exercise on files

sno.	Experiment Name	Competencies	Key Competencies
	Programming experiments		
1	Familiarise UNIX operating system, UNIX commands and Vi editor	1. Practice Directory and file commands 2. Work with Vi editor commands	1. Observe the output of mkdir and cd , cp and mv commands 2. understand the difference 3. understand and observe the file permissions in chmod command
2	Understand compilers like TURBO C/ GCC /Visual C++	1. Work with TURBO C compiler 2. Follow the sequence of steps to open and create a source file 3. Editing of program 4. Debugging , compiling and executing program 5. Saving program	1. note the steps involved in editing, compiling and executing a C program 2. practice above steps on short cut keys
3	Develop the logic and draw the flow chart and write C program to 1. find average of three numbers 2. find simple interest 3. evaluate the expression a+b-c * a/e (assume the values)	1. Observe the result and apply different data on same program 2. analyze the difference between interactive and fixed data programs 3. Use the primary Data types of C language 4. analyze the associativity	1. Implementing C programs for mathematical calculations

	4. perform all arithmetic operations	of operators Use the size qualifiers of int ,char data types	
4	1. find given number is even or odd 2. find the roots of quadratic equation 3. find the largest among three numbers using if-else and nested conditional operator 4. find given year is leap year or not 5. find the electricity bill for different tariffs find the grades of student	1. analyze the methods for initialization of data-compile time and run time initialization 2. Capacity to remember syntax of conditional statements 3. Capacity to apply simple and cute logic 4. analyze single and nested conditional operator understand the rules of switch statement	1. Develop the simple logic using conditional statements
5	1. compute $y=x^n$ 2. find the sum of the following series for a given value of 'n'. 1+1/2+1/3+……..+1/n 3. display all even and odd numbers separately. 4. compute the sum of the digits of a given integer number. 5. reverse the digits of a integer number 6. check whether a number is palindrome or not. 7. enter 'n' input values and display the no. of positive values, no. of negative values and no. of zero values. 8. find the given number is prime or not 9. find the sum of squares of 'n' natural numbers 10. find the factorial of a given number 11. display all prime numbers from 1 to n (for a given value of n) 12. generate and print first 'n' Fibonacci numbers	1. Capacity to understand increment/decrement operators 2. Capacity to use break and continue statements 3. Capacity to understand execution flow of for loop 4. understand the no. of times loop execution based on condition 5. capacity to apply simple logic 6. basic idea about formulas 7. understand the meaning of palindrome, Fibonacci series, etc.	1. selection of particular loop for a specific program
6	1. find the average of 3 nos. using functions 2. interchange two numbers using call by reference and call by value techniques. 3. find the maximum value among three numbers using	1. Capacity to analyse function techniques 2. understand the difference between call by value and call by reference 3. Use of recursive function 4. return statement syntax and usage	1. developing programs with function concept

	recursive function. 4. sum of 'n' natural numbers using recursive function 5. find the factorial of a given number using recursive function.	5. understand flow of execution in functions 6. understand scope of variables	
7	1. compute the sum of elements stored in an array 2. generate and print first 'n' Fibonacci numbers using arrays 3. arrange 'n' numbers in (i) ascending and (ii) descending order. 4. display the (i) biggest number and (ii) smallest number in a given array. 5. add two matrices. 6. multiply two matrices. 7. pass array elements to a function and display the values 8. check whether a given string is palindrome or not 9. perform all string handling functions	1. Capacity to analyse accessing array elements, initializing array elements, 2. understand one dimensional and two dimensional arrays 3. understand declaration of an array 4. knowledge of passing array elements to function	1. Develop simple logic using arrays
8	1. access the members of a structure. 2. find the average marks obtained by a class of 30 students in a test (use structures) 3. implement array of structures 4. implement nested structures 5. pass entire structure to a function and access the members	1. knowledge about syntax of structure 2. accessing structure members 3. rules for initializing values to the members 4. understand the concept of nested structure 6. understand the methods to pass members to a function	1. structure implementation in C programs
9	1. access address of a variable and variable through its pointer 2. perform pointer arithmetic operation 3. compute the sum of elements of an array using pointers 4. pass pointers as function arguments 5. implement function returning pointers read and print an array of structures using pointers	1. understand the pointer concepts 2. capacity to analyze pointer increment 3. capacity to understand relation of arrays and pointers 4. understand usage of pointers to access structure members	1. Usage of pointers in C

10	1. open a file and write some text and display it on the monitor 2. copy data from one file to another file using fprintf and fscanf	1. understand all file functions and syntax 2. analyze the difference of getc,getchar,putc and putchar functions 3. knowledge about open and closing file 4. understand the declaration of file pointer	1. File operations in C