STATE BOARD OF TECHNICAL EDUCATION & TRAINING

Diploma in Electronics & Communication Engineering

DRAFT CURRICULUM C-16/17

I SEMESTER

C-16 SCHEME OF INSTITUTIONS AND EXAMINATIONS I SEMESTER- DECE								
		Institution periods/week		Scheme of Examination				
Subject Code	Name of the subject	Theory	Practical	Periods	Duration(Hours)	Sessional marks	End exam marks	Total marks
THEORY SUBJECTS								
EC-101	English	3		45	3	20	80	100
EC-102	Engineering mathematics-I	5		75	3	20	80	100
EC-103	Engineering Physics	4		60	3	20	80	100
EC-104	Engineering Chemistry & Environmental studies	4		60	3	20	80	100
EC-105	Basic Electronic s-1	5		75	3	20	80	100
EC-106	Basic Electrical Engineering	5		75	3	20	80	100
PRACTICAL SUBJECTS								
EC-107	Engineering Drawing		6	90	3	40	60	100
EC-108	Basic Electronics Workshop Practice		4	60	3	40	60	100
Ec-109	Physics Lab		3	45	1.5	20	30	50
EC-110	Chemistry Lab				1.5	20	30	50
EC-111	Computer Fundamentals Lab		3	45	3	40	60	100
	Total	26	16	630		280	720	1000

English for Polytechnics

(Common to All the Branches)

First Semester

Subject Code **EC: 101**
No. of periods per week **: 3**
No. of periods per year **: 45**

Objectives and Key Competencies

Sl. No.	Name of the Unit	Objectives	Key Competencies
01	**Need for English**	• Understand the need to learn English • Find solutions to some problems of Learning English	• Know the need to learn English • Identify the problems students face in learning |English • Discuss the various solutions to overcome them
02	**Classroom English**	• Identify expressions useful in the classroom • Use classroom expressions meaningfully	• How to greet the teacher and other students • Learn the expressions frequently used by the teacher • Practise to express one's ideas in English
03	**Expressing Feelings**	• Express feelings • Speak about what others feel	• Know the structures to express feelings • Use the vocabulary related to feelings
04	**Expressing Likes and Dislikes**	• Express likes and dislikes • Express likes and dislikes of others	• Study the different ways to express likes and dislikes • Learn several words and phrases to express likes and dislikes
05	**Making requests**	• Learn some ways of making requests • Learn some ways of offering help	• Examine the various structures to make requests • Learn to make requests in formal and informal situations
06	**The Mighty Mountain and**	• Comprehend the central idea • Learn about Expeditions	• Understand the main idea • Practise to read aloud

	Little Lads of Telangana		• Learn new vocabulary
07	**Adventures of Toto**	• Read and comprehend the main idea • Appreciate a humorous narrative	• Understand the central idea • Learn to make inferences • Learn new vocabulary • Complete a story
08	**Tiller Turns Engineer – An Innovation**	• Read and understand the main idea • Improve your vocabulary	• Focus on minute details • Develop innovative skills • Present one's view
09	**The Present Tense- I**	• Differentiate between time and tense • Describe habits and facts	• Learn the three broad categories of tense • Learn the action words and auxiliary words • Learn the simple present tense structure • Talk about routine, habits and facts • Make negative sentences
10	**The Present Tense- II**	• Describe the actions happening in the present • Describe past actions as relevant to the present	• Express the actions happening in the present • Express the actions that have been completed in the recent past • Make sentences in the present perfect continuous tense
11	**The Past Tense- I**	• Understand what irregular verbs are • Describe actions which took place in the past	• Learn the irregular verbs • Narrate the stories or incidents in simple past tense
12	**The Past Tense- II**	• Describe an action that was happening in the past • Describe a past action that took place before another past action	• Describe the actions in progress in the past • Use past perfect tense
13	**The Future Tense**	• Describe future actions • Understand various aspects of future tense	• Express the actions that are going to happen in the future • Know the uses of the modals

14	**Basic Sentence Structures- I**	• Understand basic sentence structures • Use basic sentence structures in spoken and in written forms • Identify common errors in the usage of basic sentence structures	• Learn how English is different from Indian Languages from structures point of view • Learn intransitive verbs • Use Subject +Verb structure • Use Subject + Verb + Subject Complement structure
15	**Basic Sentence Structures- II**	• Understand basic sentence structures • Form basic sentence structures	• Learn transitive verbs which are followed by only one object • Learn transitive verbs which are followed by two objects • Identify the structures • Use Object complement structure
16	**Voice – I**	• Identify and use the passive voice • Know when the passive voice is used • Use the passive voice	• Learn when to use the active voice and passive voice • Observe the language used in sign boards and newspaper headlines • Change the voice
17	**Voice – II**	• Identify the two objects of a verb • Omit the object in a passive voice sentence	• Change the voice when two objects are given
18	**Asking Yes/No Questions**	• Understand the word order in questions • Ask yes/no questions	• Communicate using yes/no questions • Invert the position of helping verb to make questions • Know the common errors in framing questions
19	**Asking Wh-Questions**	• Frame wh- questions • Seek information using such questions	• Learn wh- words • Ask for specific information using wh- questions
20	**Paragraph Writing – I**	• Generate ideas for writing a paragraph • Organize ideas before writing • Write a short paragraph	• Write a paragraph using hints • Organize the ideas • Write the rough draft • Edit the paragraph to make final copy

21	**Paragraph Writing – II**	• Identify a topic sentence • Write a cohesive paragraph • Write supporting sentences	• Write a short paragraph using the first sentence • Learn a few ways of beginning paragraph • Write a few supporting sentences • Write a short paragraph
22	**Letter Writing – I**	• Understand the format of a personal letter • Write a personal letter	• Learn the main components (the format) of a personal letter • Practise a few ways of greetings, openings and closures • Write a personal letter
23	**Letter Writing - II**	• Understand the format of an official letter • Write an official letter	• Know the format of official letters • Learn the expressions often used in official letters • Write an official letter using the hints

Weightage Table

Sl. No	Module	Short Questions	Essay questions
1	Speaking	8	1
2	Grammar	12	1 (questioning)
3	Reading	---	2
4	Writing	---	4 (2 from paragraph writing and 2 from letter writing)

ENGINEERING MATHEMATICS - I

(Common to all branches)

Subject title : Engineering Mathematics-I
Subject code : EC-102
Periods per week : 5
Total Periods per Semester : 75

Time Schedule with BLUEPRINT

S. No	Major Topic	No of Periods		Weightage of Marks	Short Type			Essay Type		
	Unit - I Algebra	**Theory**	**Practice**		**R**	**U**	**App**	**R**	**U**	**App**
1	Logarithms	2	1	2	0	1	0	0	0	0
2	Partial Fractions	5	1	9	1	1	0	½	0	0
3	Matrices and Determinants	18	6	25	2	3	0	0	½	1
	Unit - II Trigonometry									
4	Compound Angles	4	2	14	1	1	0	1	0	0
5	Multiple and Submultiple angles	6	3	16	1	2	0	0	1	0
6	Transformations	6	3	17	1	0	0	0	½	1
7	Inverse Trigonometric Functions	6	2	17	1	0	0	½	1	0
8	Properties of triangles	2	0	4	2	0	0	0	0	0
9	Hyperbolic Functions	2	0	2	1	0	0	0	0	0
10	Complex Numbers	4	2	14	1	1	0	1	0	0
	Total	55	20	120	11	9	0	3	3	2
	Marks				22	18	0	30	30	20

R: Remembering type : 52 marks
U: Understanding type : 48 marks
App: Application type : 20 marks

ENGINEERING MATHEMATICS – I

COMMON TO ALL BRANCHES – 102

Objectives

Upon completion of the course the student shall be able to:

UNIT – I

Algebra

1.0 Use Logarithms in engineering calculations

1.1 Define logarithm and list its properties.

1.2 Distinguish natural logarithms and common logarithms.

1.3 Explain the meaning of e and exponential function.

1.4 State logarithm as a function and its graphical representation.

1.5 Use the logarithms in engineering calculations.

2.0 Resolve Rational Fraction into sum of Partial Fractions in engineering problems

2.1 Define the following fractions of polynomials:

1. Rational,
2. Proper
3. Improper

2.2 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

$i)\quad \dfrac{f(x)}{(x+a)(x+b)(x+c)}$ $\qquad ii)\quad \dfrac{f(x)}{(x+a)^2(x+b)(x+c)}$

$iii)\quad \dfrac{f(x)}{(x^2+a)(x+b)}$ $\qquad iv)\quad \dfrac{f(x)}{(x+a)(x^2+b)^2}$

3.0 Use Matrices for solving engineering problems

3.1 Define a matrix and order of a matrix.

3.2 State various types of matrices with examples (emphasis on 3rd order square matrices).

3.3 Compute sum, scalar multiplication and product of matrices.

3.4 Illustrate the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.

3.5 Define the transpose of a matrix and write its properties.

3.6 Define symmetric and skew-symmetric matrices.

3.7 Resolve a square matrix into a sum of symmetric and skew- symmetric matrices with examples in all cases.

3.8 Define minor, co-factor of an element of a 3x3 square matrix with examples.

3.9 Expand the determinant of a 3 x 3 matrix using Laplace expansion formula.

3.10 Distinguish singular and non-singular matrices.

3.11 Apply the properties of determinants to solve problems.

3.12 Solve system of 3 linear equations in 3 unknowns using Cramer's rule.

3.13 Define multiplicative inverse of a matrix and list properties of adjoint and inverse.

3.14 Compute adjoint and multiplicative inverse of a square matrix.

3.15 Solve system of 3 linear equations in 3 unknowns by matrix inversion method

3.16 State elementary row operations.

3.17 Solve a system of 3 linear equations in 3 unknowns by Gauss- Jordan method

UNIT – II

Trigonometry:

4.0 Solve simple problems on Compound Angles

4.1 Define compound angles and state the formulae of Sin (A±B), Cos (A±B), tan (A±B) and Cot (A±B)

4.2 Give simple examples on compound angles to derive the values of $Sin15^0$, $Cos15^0$, $Sin75^0$, $Cos75^0$, $\tan 15^0$, $\tan 75^0$ etc.

4.3 Derive identities like Sin (A+B) .Sn (A–B) = $Sin^2 A – Sin^2 B$ etc.

4.4 Solve simple problems on compound angles.

5.0 Solve problems using the formulae for Multiple and Sub- multiple Angles

5.1 Derive the formulae of multiple angles 2A, 3A etc. and sub multiple angles A/2 in terms of angle A of trigonometric functions.

5.2 Derive useful allied formulas like $\sin^2 A = (1 - \cos 2A)/2$ etc.

5.3 Solve simple problems using the above formulae

6.0 Apply Transformations for solving the problems in Trigonometry

6.1 Derive the formulae on transforming sum or difference of two trigonometric ratios in to a product and vice versa - examples on these formulae.

6.2 Solve problems by applying these formulae to sum or difference or product of three or more terms.

7.0 Use Inverse Trigonometric Functions for solving engineering problems

7.1 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.

7.2 Define inverses of six trigonometric functions along with their domains and ranges.

7.3 Derive relations between inverse trigonometric functions so that given $A = \sin^{-1} x$, express angle A in terms of other inverse trigonometric functions - with examples.

7.4 State various properties of inverse trigonometric functions and identities like $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$ etc.

7.5 Derive formulae like $\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left(\frac{x+y}{1-xy}\right), \ where \ x \geq 0, y \geq 0, xy < 1$ etc., and solve simple problems.

8.0 Appreciate Properties of triangles

8.1 State sine rule, cosine rule, tangent rule and projection rule.

9.0 Represent the Hyperbolic Functions in terms of logarithm functions

9.1 Define Sinh x, cosh x and tanh x and list the hyperbolic identities.

9.2 Represent inverse hyperbolic functions in terms of logarithms.

10.0 Represent Complex numbers in various forms

10.1 Define complex number, its modulus and conjugate and list their properties.

10.2 Define the operations on complex numbers with examples.

10.3 Define amplitude of a complex number

10.4 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form – illustrate with examples.

COURSE CONTENT

Unit-I

Algebra

1. Logarithms:

Definition of logarithm and its properties, natural and common logarithms; the meaning of e and exponential function, logarithm as a function and its graphical representation.

2. Partial Fractions:

Rational, proper and improper fractions of polynomials. Resolving rational fractions in to their partial fractions covering the types mentioned below:

$$i) \quad \frac{f(x)}{(x+a)(x+b)(x+c)} \qquad ii) \quad \frac{f(x)}{(x+a)^2(x+b)(x+c)}$$

$$iii) \quad \frac{f(x)}{(x^2+a)(x+b)} \qquad iv) \quad \frac{f(x)}{(x+a)(x^2+b)^2}$$

Matrices:

3. Definition of matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, scalar multiplication and product of matrices. Transpose of a matrix, Symmetric, skew-symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion, properties of determinants. Singular and non-singular matrices-Adjoint and multiplicative inverse of a square matrix- examples-System of linear equations in 3 variables-Solutions by Cramer's rule, Matrix inversion

method-examples-Elementary row operations on matrices -Gauss-Jordan method to solve a system of equations.

Unit-II

Trigonometry:

4. Compound angles: Formulas of sin (A±B), cos (A±B), tan (A±B), cot (A±B) and related identities with problems.
5. Multiple and sub-multiple angles: trigonometric ratios of multiple angles 2A, 3A and submultiple angle A/2 with problems.
6. Transformations of products into sums or differences and vice versa simple problems
7. Inverse trigonometric functions: definition, domains and ranges-basic properties-problems.
8. Properties of triangles: relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule – statements only.
9. Hyperbolic functions: Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.
10. Complex Numbers: Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitude (polar) form, Exponential (Euler) form of a complex number- Problems.

Reference Books:

1. A text book of matrices by Shanti Narayan,
2. Plane Trigonometry, by S.L Loney

ENGINEERING PHYSICS-I

Subject Title : Engineering Physics - I
Subject Code : EC -103
Periods per week : 04
Total periods per semester : 60

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type (2 marks)	Essay Type (10 marks)
1.	Units and Dimensions	08	08	4	-
2.	Modern Physics	12	28	4	2
3.	Heat and Thermodynamics	12	28	4	2
4.	Elements of Vectors	14	28	4	2
5.	Kinematics	14	28	4	2
	Total:	**60**	**120**	**20**	**8**

INTERNAL ASSESSMENT

UNIT TEST 1 : UNITS 1,2 and 3

UNIT TEST 2 : UNITS 4 and 5

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Units and dimensions

1.1 Explain the concept of Units
1.2 Define the terms
a) Physical quantity, b) Fundamental physical quantities and
c) Derived physical quantities
1.3 Define unit
1.4 Define fundamental units and derived units
1.5 State SI units with symbols
1.6 State Multiples and submultiples in SI system
1.7 State Rules of writing S.I. units
1.8 State advantages of SI units
1.9 Define Dimensions
1.10 Write Dimensional formulae
1.11 Derive dimensional formulae of physical quantities
1.12 List dimensional constants and dimensionless quantities
1.13 State the principle of Homogeneity of Dimensions
1.14 State the applications of Dimensional analysis (without problems)
1.15 State the limitations of dimensional analysis

2.0 Understand the concept of Modern physics

2.1 Explain Photo-electric effect
2.2 Write Einstein's photoelectric equation
2.3 State the laws of photoelectric effect
2.4 Explain the Working of a photoelectric cell
2.5 List the Applications of photoelectric effect
2.6 Recapitulate refraction of light and its laws
2.7 Define critical angle
2.8 Explain the Total Internal Reflection
2.9 Explain the basic principle of optical Fiber
2.10 Mention types of optical fibbers
2.11 List the applications of optical Fiber
2.12 Define super conductor and superconductivity
2.13 List the examples of superconducting materials
2.14 List the applications of superconductors

3.0 Understand the concept of Heat and thermodynamics

3.1 Explain the concept of expansion of gases
3.2 Explain Boyle's law
3.3 State Charle's laws in terms of absolute temperature
3.4 Define absolute zero temperature
3.5 Explain absolute scale of temperature
3.6 Define ideal gas
3.7 Derive the ideal gas equation.
3.8 Define gas constant and Universal gas constant
3.9 Explain why universal gas constant is same for all gases
3.10 State SI unit of universal gas constant
3.11 Calculate the value of universal gas constant
3.12 State the gas equation in terms of density
3.13 Distinguish between r and R
3.14 Define Isothermal process
3.15 Define adiabatic process
3.16 Distinguish between isothermal and adiabatic process
3.17 State first and second laws of thermodynamics
3.18 Define specific heats & molar specific heats of a gas
3.19 Derive the relation $C_p - C_v = R$
3.20 Solve the related numerical problems

4.0 Understand the concept of Elements of Vectors

4.1 Explain the concept of Vectors
4.2 Define Scalar and Vector quantities
4.3 Give examples for scalar and vector quantities
4.4 Represent a vector graphically
4.5 Classify the Types of Vectors
4.6 Resolve the vectors
4.7 Determine the Resultant of a vector by component method
4.8 Represent a vector in space using unit vectors (i, j, k)
4.9 State triangle law of addition of vectors
4.10 State parallelogram law of addition of vectors
4.11 Illustrate parallelogram law of vectors in case of flying bird and sling.
4.12 Derive an expression for magnitude and direction of resultant of two vectors

4.13 State polygon law of addition of vectors
4.14 Explain subtraction of vectors
4.15 Define Dot product of two vectors with examples (Work done, Power)
4.16 Mention the properties of Dot product
4.17 Define Cross products of two vectors and state formulae for torque and linear velocity
4.18 Mention the properties of Cross product.
4.19 Solve the related numerical problems

5.0 Understand the concept of Kinematics

5.1 Write the equations of motion in a straight line
5.2 Explain the acceleration due to gravity
5.3 Derive expressions for vertical motion
a) Maximum Height, b) time of ascent, c) time of descent, and d) time of flight
5.4 Derive an expression for height of a tower when a body projected vertically upwards from the top of a tower.
5.5 Explain projectile motion with examples
5.6 Explain Horizontal projection
5.7 Derive an expression for the path of a projectile in horizontal projection
5.8 Explain Oblique projection
5.9 Derive an expression for the path of projectile in Oblique projection
5.10 Derive formulae for projectile in Oblique projection
a) Maximum Height, b) time of ascent, c) time of descent, d) time of flight
e) Horizontal Range and f) Maximum range
5.11 Solve the related numerical problems

COURSE CONTENT

1. Units and Dimensions:

Introduction – Physical quantity – Fundamental and Derived quantities – Fundamental and Derived units- SI units –Multiples and Sub multiples – Rules for writing S.I. units- Advantages of SI units – Dimensions and Dimensional formulae- Dimensional constants and Dimensionless quantities- Principle of Homogeneity- Applications and limitations of Dimensional analysis.

2. Modern Physics;

Photoelectric effect –Einstein's photoelectric equation-laws of photoelectric effect - photoelectric cell –Applications of photo electric effect- Total internal reflection- fiber optics- -principle of an optical fiber-types of optical fibers - Applications of optical fibers- concepts of superconductivity - applications

3. Heat and Thermodynamics:

Expansion of Gases- Boyle's law- Absolute scale of temperature- Charle's laws- Ideal gas equation- Universal gas constant- Differences between r and R- Isothermal and adiabatic processes- Laws of thermodynamics- Specific heats of a gas - Problems

4. Elements of Vectors:

Scalars and Vectors –Types of vectors(Proper Vector, Null Vector, Unit Vector, Equal ,

Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).Addition of vectors- Representation of vectors- Resolution of vectors - Parallelogram, Triangle and Polygon laws of vectors–Subtraction of vectors- Dot and Cross products of vectors-Problems

5. Kinematics:

Introduction- Concept of acceleration due to gravity- Equations of motion for a freely falling body and for a body thrown up vertically- Projectiles- Horizontal and Oblique projections- Expressions for maximum height, time of flight, range - problems

REFERENCE BOOKS

1. Intermediate physics Volume- I & 2	Telugu Academy
2. Text book of physics	Resnick & Holiday
3. Engineering physics	Gaur and Gupta
4. Fundamental Physics Volume -1 & 2	K.L.Gomber and K.L.Gogia

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES - I

Subject Title : **Engineering Chemistry and Environmental Studies - I**
Subject Code : **EC-104**
Periods per week : **04**
Total periods per semester : **60**

TIMESCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type (2 marks)	Essay Type (10 marks)
1.	FUNDAMENTALS OF CHEMISTRY	18	40	5	3
2.	SOLUTIONS	10	18	4	1
3.	ACIDS & BASES	10	18	4	1
4.	WATER TECHNOLOGY	14	28	4	2
5.	ENVIRONMENTAL STUDIES – 1	08	16	3	1
	Total:	**60**	**120**	**20**	**8**

OBJECTIVES

Upon completion of the course the student shall be able to

A. ENGINEERINGCHEMISTRY

1.0 Fundamentals of Chemistry

1.1 Explain the fundamental particles of an atom like electron, proton and neutron etc.,
1.2 Explain the concept of atomic number and mass number
1.3 State the Postulates of Bohr's at omic theory and its limitations
1.4 Explain the concept of Quantum numbers with examples
1.5 Explain 1.Aufbau'sprinciple, 2.Hund'sruleand 3.Pauli'sexclusion principle with examples.
1.6 Define Orbital.
1.7 Draw the shapes of s,pandd Orbitals.
1.8 Distinguish between Orbitand Orbital
1.9 Write the electronic configuration of elements up to atomic number 30
1.10 Define chemical bond.

1.11 Explain the Postulates of Electronic theory of valancy

1.12 Define and explain three types of Chemical bonding viz., Ionic Covalent, Coordinate covalent bond with examples.

1.13 Explain bond formation in NaClandMgO

1.14 List the Properties of Ionic compounds

1.15 Explain covalent bond formation in Hydrogen molecule, Oxygen molecule, and Nitrogen molecule using Lewis dot method.

1.16 List the Properties of Covalent compounds

1.17 Distinguish between ionic compounds and covalent compounds.

1.18 Define the terms 1.Oxidation, 2.Reduction 3.Oxidation number 4. Valency, with examples.

1.19 Calculate the Oxidation Number

1.20 Differentiate between Oxidation Number and Valency.

2.0 Solutions

2.1 Define the terms 1.Solution, 2.Soluteand 3.Solvent

2.2 Classify solutions based on physical state.

2.3 Define solubility, unsaturated, saturated and super saturated solutions.

2.4 Define mole.

2.5 Explain Mole concept with examples.'

2.6 Define the terms 1. Atomic weight, 2.Molecular weight and 3. Equivalent weight

2.7 Calculate Molecular weight and Equivalent weight of Acids, Bases and Salts.

2.8 Define 1.Molarity and Normality.

2.9 Solve Numerical problems on Mole, Molarity and Normality

3.0 Acids and bases

3.1 Explain Arrhenius theory of Acids and Bases

3.2 State the limitations of Arrhenius theory of Acid sand Bases

3.3 Explain Bronsted–Lowry theory of acids and bases.

3.4 State the limitations of Bronsted–Lowry theory of acids and bases.

3.5 Explain Lewis theory of acids and bases

3.6 State the limitations Lewis theory of acids and bases

3.7 Explain the Ionic product of water

3.8 Define pH and explain Sorenson scale

3.9 Solve the Numerical problems on pH (Strong Acids and Bases)

3.10 Define buffer solution and give examples.

3.11 State the applications of buffer solutions.

4. 0 Water Technology

4.1 State the various Sources of water.

4.2 Define the terms soft water and hardwater with examples

4.3 Define hardness of water.

4.4 Explain temporary and permanent hardness of water.

4.5 List the usual chemical compounds causing hardness (with Formulae)

4.6 Define Degree of hardness, units of hardness in ppm(mg/L) and numerical problems related to hardness.

4.7 Disadvantages of using hardwater in industries.

4.8 Explain the methods of softening of hardwater:a) permut it process b).Ion-Exchange process.

4.9 Essential qualities of drinking water.

4.10 Explain municipal treatment of water for drinking purpose.

4.11 Define Osmosis and Reverse Osmosis(RO).

4.12 List the advantages of RO

5.0. ENVIRONMENTALSTUDIES

5.1 Define the term environment

5.2 Explain the scope and importance of environmental studies

5.3 Explain the following terms 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere,4).Biosphere, 5)Pollutant, 6).Contaminant 7) Pollution 8)receptor 9)sink 10) particulates, 11)Dissolved oxygen(DO), 12).Threshold limit value(TLV), 13).BOD, and 14).COD

5.4 Explain the growing energy needs

5.5 Explain renewable(non-conventional) and non renewable(conventional) energy sources with examples.

5.6 Define an Ecosystem. understand biotic and abiotic components of ecosystem.

5.7 Define the terms:

1).Producers, 2).Consumers and 3).Decomposers with examples.

5.8 Explain biodiversity and threats to biodiversity

COURSE CONTENT

A. ENGINEERINGCHEMISTRY

1. Fundamentals of Chemistry

Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers – Aufbau principle - Hand's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements

Chemical Bonding: Introduction – Valency, types of chemical bonds – Ionic, covalent and co-ordinate covalent bond with examples–Properties of Ionic and Covalent compounds

Oxidation-Reduction: Concepts of Oxidation- Reduction, Oxidation Number- calculations,

2. Solutions

Introduction-concentration methods – Mole concept, Molarity, Normality, Equivalent weights, Numerical problems on Mole, Molarity and Normality

3. Acids and Bases

Introduction – theories of acids and bases and limitations – Arrhenius theory-Bronsted – Lowry theory – Lewis acid base theory – Ionic product of water– pH and related numerical problems–buffer solutions–Applications.

4. Water technology

Introduction–soft and hardwater–causes of hardness–types of hardness –disadvantages of hard water – degree of hardness (ppm) – softening methods – permut it process – ion exchange process – numerical problems related to degree of hardness – drinking water – municipal treatment of water for drinking purpose – Osmosis, Reverse Osmosis - advantages of Reverse osmosis'.

5. ENVIRONMENTALSTUDIES

Introduction–environment–scopeandimportanceofenvironmentalstudies important terms– renewable and nonrenewable energy sources–Concept of ecosystem, producers, consumers and decomposers – Biodiversity, definition and threats to Biodiversity.

INTERNAL ASSESSMENT

UNIT TEST 1 : UNITS 1 and 2

UNIT TEST 2 : UNITS 3,4 and 5

REFERENCEBOOKS

1. Intermediate chemistry Vol 1&2 Telugu Acedemy
2. Engineering Chemistry Jain & Jain
3. Engineering Chemistry O.P. Agarwal, Hi-Tech.
4. Engineering Chemistry Sharma
5. Engineering Chemistry A.K. De

Basic Electronics -1

Subject Title : Basic Electronics-1
Subject Code : EC-105
Periods/Week : 05
Periods/Year : 75

TIME SCHEDULE

Sl. No	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Classification of Electronic Engineering Materials	16	14	2	1
2	Resistors	12	22	6	1
3	Special purpose Resistors	10	14	2	1
4	Inductors &Capacitors	20	32	6	2
5	Switches, connectors and Relays	9	25	2	2
6	PCB Fabrication	8	20	2	1
	Total	75	120	20	8

OBJECTIVES

On completion of the course the student should be able to

1.0 Classification of Electronic Engineering Materials:

1.1 Explain the atomic structure of the atom.

1.2 Explain the electronic structure of the atom.

1.3 Explain energy band diagram.

1.4 Classify the material into conducting, semi conducting and insulating materials.

1.5 Distinguish between conductor, insulator and semi-conductor with respect to valence electrons.

1.6 Explain the effect of impurities on resistance of a conductor

1.7 List the 4 Metals commonly used in Electrical and Electronics fields .

1.8 Define the following Mechanical properties of materials.

1. Density 2.Stress 3.Strain 4.strength 5.Ductility 6.Hardness 7.Wear 8.Impact resistance 9. Fracture 10.Toughness 11.Fatigue.

1.9 Classify the magnetic Materials (Ferromagnetic, Paramagnetic, Diamagnetic and Ferrimagnetic).

1.10 Define the above magnetic materials.

1.11 Define Soft and Hard magnetic materials.

1.12 Distinguish between soft and Hard magnetic Materials.

1.13 Give 3 examples for each.

1.14 List the important magnetic materials used in the Electrical &Electronic industry.

1.15 List the important properties of Magnetic materials.

1.16 Explain the effect of temperature on magnetism.

1.17 Define the curie point.

1.18 Explain the terms Hysteresis and Hysteresis loss.

1.19 Define an alloy.

1.20 Explain the need for alloying.

1.21 List the 6 important alloys used in electrical engineering.

1.22List alloys used for Bimetallic strips , soldering and fuse material.

1.23 Give the Composition of manganin, constantin, Nichrome, and solder metal.

1.24 Mention the uses of above alloys.

1.25 Explain the use of Nickel-iron alloys.

1.26 Explain superconductivity phenomenon.

1.27 List 3 superconducting metals.

1.28 Mention the 3 applications of superconductivity.

2.0 Understand passive components:

2.1 Classify types of resistors.
2.2 List the specifications of a resistor, and state their importance.
2.3 Explain the necessity of preferred values in resistor.
2.4 Explain the features of following Resistors.
2.5 Carbon Film Resistors
2.6 Metal film Resistors
2.7 Metal oxide Resistors
2.8 Precision Resistors
2.9 List the applications of the above Resistors.
2.10 Identify Resistance Value by using Colour Code(4band and 5 band).
2.11 List the common faults in resistors.
2.12 Classify wire wound Resistors.
2.13 Explain the constructional details of wire wound resistors.
2.14 List any 4 applications of Wire wound Resistor .
2.15 List the two types of Variable resistors .
2.16 Distinguish between Preset and Potentiometer.
2.17 Draw the European and US standard symbols of Potentiometers and Presets.
2.18 Describe constructional details of carbon and wire wound potentiometers.
2.19 Compare the features of carbon and wire wound potentiometers.

3.0 Special Purpose Resistors

3.0. List different types of Presets and Trimmers.
3.1. Mention any 3 applications of precision multi turn Cermet trimmer.
3.2. Mention the need for tapering in potentiometers.
3.3. Define Linear and Logarithmic Potentiometers.
3.4. Explain the construction and working of rheostat.
3.5. Explain the use of Rheostat as 1. Variable Resistance. 2. Potentiometer.
3.6. List the 4 types of special Resistors (Thermistor ,Sensistor, LDR and VDR).
3.7. Explain P.T.C. and N.T.C. of Resistors.
3.8. Explain the working of thermistor and sensistor.
3.9. Give standard specifications for the above.

3.10. List any 3 applications. of above.

3.11. Give Constructional details of LDR (Light Dependent Resistor).

3.12. List 3 important specifications of LDR.

3.13. List any 3 applications of LDR.

3.14. Explain the use of VDR.

4.0 Familiarise with different types of inductors used in electronic circuits and their applications

4.1. Classify inductors

4.2. Draw the symbol of differenttypes of inductors.

4.3. List the specifications of inductors.

4.4. List and Explain the important parameters of Air cored inductors.

4.5. Explain the terms Stray inductance and stray capacitance.

4.6. List various core materials used in the construction of inductors.

4.7. List the applications of A.F. and R.F chokes.

4.8. List the common faults in inductors.

4.9. Define Transformer

4.10. Explain the principle of Transformer

4.11. Mention the use of transformer in electrical and electronic Engineering applications

4.12. Explain the use of Ferrites in the construction of high frequency inductors.

4.13. **Know the different types of capacitors**

4.14. Classify the different types of capacitors.

4.15. List the specifications of a capacitor and state their importance.

4.16. Explain different markings on the a) Electrolytic capacitors b) Ceramic and Plastic capacitors (Value , Polarization, Voltage, Tolerance , temperature rating).

4.17. Define working voltage of a capacitor.

4.18. Reading of capacitor value and tolerance by 1. Colour code. 2.Value printed.

4.19. State the factors affecting the capacitance of a capacitor.

4.20. Mention the properties, range of values and applications of

a. Paper 2. mica, 3. glass, 4. polyester 5. Polystyrene 6.ceramic 7. Electrolytic capacitors.

4.21. Explain the importance of polarity in Electrolytic capacitors.

4.22. Explain the use of capacitors for coupling AC signal and blocking DC.

4.23. Explain self healing in metalized capacitors.

4.24. List different types of variable capacitors and mention their applications.

4.25. Explain the use of ganged capacitor in AM radio for tuning.

4.26. Explain the use of trimmer capacitors.

4.27. Mention the losses in capacitors.

4.28. List 3 common faults in capacitors.

5.0 Know the different types of switches, Connectors and Relays.

5.0. Explain the working of a switch.

5.1. Classify switches according to poles and throws (SPST, SPDT, DPST, DPDT, Multi-pole multi-throw).

5.2. Explain the working of toggle, push button, rotary, slider, keyboard, and thumb wheel switches with a mention to their ratings and applications.

5.3. Draw the I.S.I symbols of various switches.

5.4. Explain the need of fuse in electronic equipment.

5.5. Mention different types of fuses.

5.6. List 3 metals used for fuses.

5.7. Mention significance of fuse ratings.

5.8. State the need for connectors in electronic circuits.

5.9. List different types of connectors.

5.10. Mention the use of MCB.

5.11. Define an Electromagnetic relay.

5.12. Draw the symbol of a relay.

5.13. Classify different relays based on principle of operation, polarization and application.

5.14. Mention specifications of relays.

5.15. Explain the construction & working of general-purpose electromagnetic relay.

5.16. Explain the purpose of NC and NO contacts.

5.17. Explain arcing during changeover.

5.18. List the contact materials used in relays and list their characteristics.

5.19. Explain the use of solenoid.

5.20. Explain the need for fly back diode across the relay coil when used in electronic circuits.

5.21. Distinguish between relay and contactor.

6.0 Comprehend PCB materials and their fabrication.

6.1. Explain the need of PCB in electronic equipment.

6.2. Classify PCBs.

6.3. List types of laminates used in PCBs.

6.4. Mention the methods of layout preparation of PCB.

6.5. List the methods of transferring layout on the copper clad sheet.

6.6. List the steps involved in screen-printing for making PCBs.

6.7. List the materials used in screen-printing.

6.8. Describe the photo processing techniques for PCB preparation.

6.9. Mention the methods of etching, cleaning and drilling of PCB.

6.10. Describe the steps involved in making double-sided PCB.

6.11. Give the standard specification for PCB.

6.12. Explain the need for multilayer PCBs.

6.13. Explain the use of Surface mount Technology (SMT).

COURSE CONTENT

1. Classification of Electronic Engineering Materials: Atomic structure of the atom - Electronic structure of the atom - Energy band diagram - Types of materials –Conductors- Insulators& Semiconductors-Effect of impurities- Magnetic Materials – Classification- Ferromagnetic, Paramagnetic, Diamagnetic and Ferrimagnetic - Soft and Hard magnetic materials - Important magnetic materials used in the Electrical &Electronic industry - Properties of Magnetic materials - Effect of temperature on magnetism - Curie point - Hysteresis and Hysteresis loss.- Alloys - Important alloys used in electrical engineering - Low resistivity copper alloys: Brass, BronzeCombination alloys of manganin, constantin, Nichrome, and solder metal and their uses - Uses of Nickel-iron alloys Superconductivity phenomenon - Superconducting metals - Applications of superconductivity.

2.Passive components:

Resistors: Types of resistors- specifications - Preferred values- features of Carbon Film Resistors,Metal film Resistors ,Metal oxide Resistors. Precision Resistors-applications - Using Colour Code.(4band and 5 band) - Common faults in resistors.Wire wound Resistors Types-Constructional details of wire wound resistors. Types of Variable resistors (Potentiometer and Preset) European and US standard symbols -Constructional details of carbon and wire wound potentiometers.- Features of carbon and wire wound potentiometers-

3. 0 Special Purpose Resistors Presets and Trimmers-Applications - Need for tapering in potentiometers -Linear and Logarithmic Potentiometers-Rheostat-Uses – Special Resistors (Thermistor , Sensistor, LDR and VDR)- P.T.C. and N.T.C. of Resistors- Specifications – Applications- Constructional details of LDR (Light Dependant Resistor)- Specifications & Applications of LDR- VDR.

4.0 Inductors: Classify inductors- symbols - Specifications - Important parameters of Air cored inductors- Stray inductance and Stray capacitance-List various core materials used constructional features - Applications of A.F. and R.F chokes- Common faults in inductors -Use of Ferrites in the construction of high frequency inductors Define Transformer - principle of Transformer-Mention the use of transformer in electrical and electronic Engineering applications-Explain the use of Ferrites in the construction of high frequency inductors.

Capacitors: Types of capacitors- specifications - markings on Capacitors - Working voltage of a capacitor-Using colour code. - Factors affecting the capacitance-properties, range of values and applications of different types of capacitors-Importance of polarity in Electrolytic capacitors-Use of capacitors for coupling AC signal and blocking DC- Self healing in metalized capacitors-Types of variable capacitors and their applications- Use of ganged capacitor in AM radio for tuning-Use of trimmer capacitors-Mention the losses in capacitors- Common faults in capacitors.

5. Switches, connectors and Relays: Switches- Classification and types -Ratings and applications. I.S.I symbols – Fuse protection-Types of fuses-Metals used for fuses- Fuse ratings- Connectors - Types of Connectors-MCB- Electromagnetic relay- Symbol -Classification - Specifications – Constructional details of general-purpose electromagnetic relay- NC and NO contacts- Arcing during changeover-- Contact materials - Use of Solenoid- Fly back diode- Difference between Relay and Contactor.

6. PCBs: Need for PCB –Classification of PCBs.- Types of laminates - Layout preparation of PCB- transferring layout - Screen-printing - materials used - photo processing techniques – etching methods- cleaning and drilling - steps involved in making double-sided PCB-- standard specification for PCB-Explain the need for multilayer PCBs- Surface mount Technology (SMT)

Subject Title : **Basic Electrical Engineering**

Subject Code : EC-106

Periods/Week : 5

Periods/Semester : 75

TIME SCHEDULE

SI	Major Topics	No. of Periods	weightage of Marks	Short Answer Questions	Essay Questions
1	Basic Principles of Electricity	10	18	4	2
2	Magnetic Effects of Electric Current	20	12	4	2
3	Electrostatics and Batteries	15	20	4	1
4	AC Fundamentals	20	16	4	2
5	Electrical Hazards-First Aid and Safety in Electronic Industry	10	6	4	1
	Total	75	120	20	8

OBJECTIVES

On completion of the course the student should be able to

1.0 Comprehend the basic Principles of Electricity

1.1 Explain the concept of Electric current, Potential difference, Voltage and emf.

1.2 Explain the concept of a circuit

1.3 State Ohm's Law

1.4 Give the concept of Resistance to flow of electrons,

1.5 Define the terms specific resistance and conductivity.

1.6 Deduce the relation $R = (\rho l) / a$

1.7 Solve simple problems using the above formula.

1.8 Explain the effects of temperature on resistance

1.9 Define temperature co- efficient of resistance.

1.10 Derive the formula $Rt = Ro (1+\alpha_o t)$ to find resistance at any given temperature

1.11 Solve Simple problems using the above formula.

1.12 Explain series and parallel connections of Resistances

1.13 Derive the expressions for equivalent resistance for series and parallel connections.

1.14 Solve simple problems on series and parallel circuits

1.15 Explain the division of current in parallel circuits

1.16 Solve simple problems on the above.

1.19 List the 4 effects of Electric current

1.20 Explain the Heating effect of Electric current

1.21 Define Electric Power

1.22 Give the formula for power and mention Units (Watts , kilo Watts , Mega watts)

1.23 Define Electrical energy and mention the units (watt hours, kilo watt hours , Megawatt hours)

1.24 Mention the typical power ratings of home appliances like Electrical lamps (Incandescent , Florescent , CFL &LED) Water Heater , electric Iron, Fans, Refrigerators , Air coolers , Television set and computer.

1.25 Calculate total Electrical energy consumption and cost given the wattage , hours of operation and Electricity tariff

1.26 Mention the merits of CFL and LED lamps over Incandescent lamps from power consumption point of view

1.27 Derive expression for conversion of Electrical energy into equivalent heat energy in kilo Calories (joules Law)

1.28 Define thermal efficiency

1.29 Solve problems on Electrical heating

1.30 Mention the practical applications of Electric heating like, Water heater, Electric Iron etc.

2.0 Understand the magnetic effects of Electric Current

2.1 State coulombs laws of magnetism.

2.2 Define the terms Absolute and relative permeability of medium.

2.3 Explain the concept of lines of force & magnetic Field.

2.4 Define field intensity, Magnetic potential, Flux, Flux density .

2.5 Give the relation between Absolute and relative permeability

2.6 Draw and explain the field patterns due to

a. Straight current carrying conductor
b. Solenoid and

c. Toroidal

2.7 Explain Work law and its applications

2.8 State Laplace law (Biot-Savart's Law)

2.9 Give expressions for field strength,

2.10 Derive the expression for magnitude of the force on a conductor in a magnetic field

2.11 Give the expression for the force between two parallel current carrying conductors

2.12 Explain the nature of the force with different directions of the currents

2.13 Define ampere

2.14 Explain the concept of the Magnetic circuit

2.15 Define magneto motive force (mmf), permeability, flux and Reluctance

2.16 Solve problems on simple magnetic circuits

2.17 Compare magnetic circuit with electric circuit.

2.18 Explain the effect of air gap in a magnetic circuit

2.19 Explain the terms leakage flux and leakage co-efficient

2.20 Give the equation for the energy stored per unit volume in a magnetic field.

2.21 Calculate energy stored per unit volume

2.22 Give the expression for lifting power of a magnet.

3.0 Understand Electrostatics and Batteries

3.1 State Coulomb's law of electrostatics and define unit charge

3.2 Define absolute and relative permittivity.

3.3 Solve simple problems based on Coulomb's law

3.4 Explain electrostatic field.

3.5 Compare electrostatic and magnetic fields

3.6 Define field intensity

3.7 State Gauss theorem

3.8 Explain the concept of electric potential and potential difference

3.9 Explain Faradays laws of Electrolysis

3.10 Explain Polarisation or Back emf

3.11 Explain how the value of Back emf can be determined

3.12 Explain series and parallel connections of cells to form Battery

3.13 Give the formulae for output voltage and current when the cells are connected

in 1.Series and 2. Parallel

3.14 Explain when it is preferred to have 1. Series connection 2.Parallel

3.15 Connection of the batteries

3.16 Define Primary and Secondary Cells.

3.17 Explain the constructional details of a Lead acid Battery

3.18 List the active materials used in the construction of lead acid Battery

3.19 Explain the chemical reactions that take place during Charging and discharging

3.20 Explain the significance of internal resistance of a Battery

3.21 Define the Ampere Hour and Watt Hour Efficiencies of the cell.

3.22 Draw the Electrical characteristics of Lead acid cell and explain.

3.23 Explain the condition of a Fully charged cell.

3.24 List the six important applications of Lead acid batteries

3.25 Explain constant current and Constant Voltage methods of Charging Lead acid batteries.

3.26 Solve simple problems to find charging current requirements

3.27 Explain the need for Trickle charging

3.28 Explain the sulphation and its prevention

3.29 List the precautions to be observed to maintain the lead acid batteries.

3.30 Compare Primary and Secondary cells.

3.31 Explain the Constructional details of lithium ion Batteries

3.32 List any 4 merits and demerits of Lithium Ion Batteries

3.33 List all the precautions to be taken when charging and discharging of lithium ion batteries

3.34 List other types of Batteries used in Electronic Industry namely A. Zinc- Carbon B. Alkaline C.9V Battery D. Button cells (both Lithium and Silver oxide types)

3.35 Mention the output voltages of above cells

3.36 Mention the Common and IEC standard codes to specify the size of the cell

3.37 Mention any 3 applications of the above

4.0 Understand the concept of Alternating current fundamentals

4.1 Explain the generation of Alternating current with simple loop generator concept.

4.2 Draw the sine wave and explain the concept of a cycle

4.3 Define Time period , Frequency and Amplitude of a sine wave

4.4 Give the formula for the instantaneous value in terms of maximum value, frequency and time.

4.5 Write different forms of emf equation

4.6 Solve simple problems to calculate Amplitude ,frequency and Time Period

4.7 Define the average value, R.M.S. value, form factor and peak factor for sine wave.

4.8 Explain the terms phase and phase difference.

4.9 Explain the concept of Leading , lagging and in phase with the help of waveforms

4.10 Explain vector representation of Alternating quantities

4.11 Draw the vector diagrams of sine waves of same frequency.

4.12 Perform addition and subtraction of alternating quantities using vector method.

4.13 Solve problems to find resultant vector of several alternating quantities**.**

5.0 **Understand Electrical Hazards – First aid and Safety**

5.1 Explain the importance of safety in the industry.

5.2 Explain the major hazards which may arise from the use of electrical equipment

5.3 Explain the precautions to be taken to prevent accidents while using Machines

5.4 Explain how human body may act as a part of the circuit and cause Electrical shock

5.5 Explain method of first aid treatment for someone suffering from electric shock.

5.6 State general electrical safety rules

5.7 Explain the safety signs and colors

5.8 Show various safety symbols and explain their meaning.

5.9 Explain the causes of Fire and fire accidents in industry.

5.10 Explain Fire prevention measures.

5.11 List 4 types of Portable fire extinguishers

5.12 Explain the choice of above extinguishers.

5.13 Explain the First aid treatment in the case of burns

COURSE CONTENT

1. Basic principles of Electricity -Concept of Electric current, potential difference, Voltage and emf and circuit-Ohm's Law -concept of Resistance - specific resistance and conductivity. Problems related to specific resistance – Effect of temperature on resistance-Temperature co-efficient of resistance.- resistance at any given temperature-Solve Simple problems - Series and parallel connections of Resistances-Formulas for equivalent resistance for series and

parallel connections.-Solve simple problems on series and parallel circuits division of current in parallel circuits-Effects of Electric current-Units of work, power and energy- Heating effect of Electric current – Electrical power - formula for power and Units -Power ratings of home appliances -Electrical energy consumption calculations - merits of CFL and LED lamps -joules Law-Thermal efficiency – solve problems on Electrical heating practical applications of Electric heating like, Water heater, Electric Iron etc.

2. Magnetic Effects of Electric Current

Coulombs laws of magnetism-Absolute and relative permeability of medium-Explain the concept of lines of force & magnetic Field- Field intensity, Magnetic potential, Flux, Flux density-Relation between Absolute and relative permeability - Field patterns due to Straight current carrying conductor ,Solenoid and Toroid

Work law and its applications- Laplace law (Biot-Savart's Law)- expressions for field strength, - magnitude of the force on a conductor in a magnetic field- force between two parallel current carrying conductors- nature of the force with different directions of the currents-Define ampere - Concept of the Magnetic circuit -Define magneto motive force (mmf), permeability, flux and Reluctance-Solve problems on simple magnetic circuits-Compare magnetic circuit with electric circuit-Effect of air gap in a magnetic circuit- leakage flux and leakage co-efficient- equation for the energy stored per unit volume in a magnetic field.-Expression for lifting power of a magnet.

3.Electrostatics& Batteries

Coulomb's law of electrostatics - Unit charge- Absolute and Relative permittivity. Problems based on Coulomb's law - Electrostatic field.-Compare electrostatic and magnetic fields - field intensity- Gauss theorem- Concept of electric potential and potential difference.

Faradays laws of Electrolysis- Polarisation or Back emf- determination of Back emf - Primary and Secondary Cells- series and parallel connections of cells to form Battery- Explain when it is preferred to have 1. Series connection 2. Parallel connection of the batteries- Constructional details of a Lead acid Battery- materials used - Chemical reactions that take place during Charging and discharging -Internal resistance of a Battery- Ampere Hour and Watt Hour Efficiencies of the cell.- Electrical characteristics of Lead acid cell -Condition of a Fully charged cell- Applications of Lead acid batteries- Constant current and Constant Voltage methods of Charging Lead acid batteries- Charging current requirements- Trickle charging- Sulphation and

its prevention- Precautions -Constructional details of lithium ion Batteries- merits and demerits of Lithium Ion Batteries-Precautions to be taken - Batteries used in Electronic Industry namely A. Zinc – Carbon B. Alkaline C.9V Battery D. Button cells (both Lithium and Silver oxide types)- output voltages of above cells- Common and IEC standard codes - Applications -Compare Primary and Secondary cells

4. AC Fundamentals :

Generation of Alternating current - Concept of a cycle -Time period , Frequency and Amplitude of a sine wave- formula for the instantaneous value- different forms of emf equation -average value, R.M.S. value, form factor and peak factor for sine wave- phase and phase difference.

5. Electrical hazards - first aid and safety- Importance of safety in the industry - Use of electrical equipment and major hazards - Precautions to be taken to prevent accidents - Human body and Electrical shock - Method of first aid treatment - General electrical safety rules - Safety signs & colors and their meaning - Fire and fire accidents in industry and prevention measures - Types of Portable fire extinguishers - Choice of fire extinguishers

Text Books

1. Electrical Technology by B L Theraja,

ENGINEERING DRAWING- I

Subject Title : **Engineering Drawing- I**
Subject Code : EC–107
Periods/Week : **06**
Periods Per Year : **90**

TIME SCHEDULE

S.No	Major Topics	No. of Drawing plates	Periods	Weightage of Marks	Short Answer Questions	Essay type Questions
1	Importance of Engineering Drawing	--	01	-	-	-
2	Engineering Drawing Instruments	01	05	-	-	-
3	Free hand lettering & Numbering	01	06	05	1	-
4	Dimensioning Practice	01	09	05	1	-
5	Geometrical constructions	03	24	25	1	02
6	Projection of points, Lines, Planes & Solids	03	21	25	1	02
7	Sectional views	03	24	20	-	02
Total		**12**	**90**	**80**	**04**	**06**

The Course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

OBJECTIVES
Upon completion of the subject the student shall be able to

1.0 Understand the basic concepts of Engineering Drawing
- 1.1 State the importance of drawing as an engineering communication medium
- 1.2 State the necessity of B.I.S. Code of practice for Engineering Drawing.
- 1.3 Explain the linkages between Engineering drawing and other subjects of study in diploma course.

2.0 Use of Engineering Drawing Instruments
- 2.1 Select the correct instruments and draw lines of different orientation.
- 2.2 Select the correct instruments and draw small and large Circles.
- 2.3 Select the correct instruments for measuring distances on the drawing.
- 2.4 Use correct grade of pencil for different types of lines, thickness and given function.
- 2.5 Select and use appropriate scales for a given application.

2.6 Identify different drawing sheet sizes as per I.S. and Standard Lay- outs.
2.7 Prepare Title block as per B.I.S. Specifications.
2.8 Identify the steps to be taken to keep the drawing clean and tidy.

Drawing Plate 1: (Having Four exercises)

3.0 Write Free Hand Lettering and Numbers

3.1 Write titles using sloping lettering and numerals of 7mm, 10mm and 14mm height
3.2 Write titles using vertical lettering and numerals of 7mm, 10mm and 14mm height
3.3 Select suitable sizes of lettering for different layouts and applications
3.4 Practice the use of lettering stencils.

Drawing plate 2: (Having 5 to 6 exercises)

4.0 Understand Dimensioning Practice

4.1 Define “Dimensioning.
4.2 State the need of dimensioning the drawing according to accepted standard.
4.3 Identify notations of Dimensioning used in dimensioned drawing.
4.4 Identify the system of placement of dimensions in the given dimensioned drawing.
4.5 Dimension a given drawing using standard notations and desired system of dimensioning.
4.6 Dimension standard features applying necessary rules.
4.7 Arrange dimensions in a desired method given in a drawing.
4.8 Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988, and dimension the same correctly.

Drawing Plate 3: (Having 8 to10 exercises)

5.0 Apply Principles of Geometric Constructions

5.1 Divide a given line into desired number of equal parts internally.
5.2 Draw tangent lines and arcs.
5.3 Use General method to construct any polygon.
5.4 Explain the importance of conics
5.5 Construct conics (ellipse, parabola and hyperbola) by general method
5.6 Construct ellipse by concentric circles method
5.7 Construct parabola by rectangle method
5.8 Construct rectangular hyperbola from the given data.
5.9 Construct involute from the given data.
5.10 Construct cycloid and helix from the given data.
5.11 State the applications of the above constructions in engineering practice.

Drawing Plate -4: Having problems up to construction of polygon
Drawing Plate -5: Having problems of construction of conics
Drawing Plate -6: Having problems of construction of involute, cycloid and helix

6.0 Apply Principles of Projection of points, lines, planes & solids

6.1 Visualize the objects
6.2 Explain the I-angle and III-angle projections
6.2 Practice the I-angle projections
6.3 Draw the projection of a point with respect to reference planes (HP&VP)

6.4 Draw the projections of straight lines with respect to two reference Planes (up to lines parallel to one plane and inclined to other plane)
6.5 Draw the projections of planes (up to planes perpendicular to one plane and inclined to other plane)
6.6 Draw the projections of solids (up to axis of solids parallel to one plane and inclined to other plane)

Drawing Plate -7: Having problems up to projection of points and Lines (15 exercises)
Drawing Plate -8: Having problems of projection of planes (6 exercises)

7.0 Appreciate the need of Sectional Views

7.1 Explain the need to draw sectional views.
7.2 Select the section plane for a given component to reveal maximum information.
7.3 Explain the positions of section plane with reference planes
7.4 Differentiate between true shape and apparent shape of section
7.5 Draw sectional views and true sections of regular solids discussed in 6.0
7.6 Apply principles of hatching.

Drawing Plate– 9: Having problems of section of solids (6 exercises)
Drawing Plate–10: Having problems of section of solids (6 exercises)

Competencies and Key competencies to be achieved by the student

S.No	Major topic	Key Competency
1.	Importance of Engineering Drawing	• Explain the linkages between Engineering drawing and other subjects of study in Diploma course.
2.	Engineering Drawing Instruments	• Select the correct instruments to draw various entities in different orientation
3.	Free hand lettering & Numbering	• Write titles using sloping and vertical lettering and numerals as per B.I.S (Bureau of Indian standards)
4.	Dimensioning Practice	• Dimension a given drawing using standard notations and desired system of dimensioning
5.	Geometrical construction	• Construct ellipse, parabola, rectangular hyperbola, involute, cycloid and helix from the given data.
6.	Projection of points, Lines, Planes & Solids	• Draw the projection of a point, straight lines, planes & solids with respect to reference planes (HP& VP)
7.	Sectional views	• Differentiate between true shape and apparent shape of section • Use conventional representation of Engineering materials as per B.I.S. Code. • Apply principles of hatching. • Draw simple sections of regular solids

COURSE CONTENT

NOTE

1. **B.I.S Specification should invariably be followed in all the topics.**
2. **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

1.0 The importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46 –1988 – Mention B.I.S - Role of drawing in -engineering education – Link between Engineering drawing and other subjects of study.

2.0 Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged -Lines: Types of lines, selection of line thickness - Selection of Pencils -Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents, Care and maintenance of Drawing Sheet, Drawing plate:

Lay out of sheet – as per SP-46-1988 to a suitable scale.

Simple Exercises on the use of Drawing Instruments. Importance of Title Block.

3.0 Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering

Practicing of letters & numbers of given sizes (7mm, 10mm and 14mm)

Advantages of single stroke or simple style of lettering - Use of lettering stencils

4.0 Dimensioning practice

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object -Definition of Dimensioning size description -Location of features, surface finish, fully dimensioned Drawing - Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools -Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features “Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

5.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts internally examples in engineering application.

Construction of tangent lines: to draw tangent lines touching circles internally and externally.

Construction of tangent arcs

i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles).

ii)Tangent arc of given radius touching a circle or an arc and a given line.

iii)Tangent arcs of radius R, touching two given circles internally and externally.

Construction of polygon:construction of any regular polygon of given side length using general method

Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a

double cone and a loci of a moving point, Eccentricity of above curves – Their Engg. application viz. Projectiles, reflectors, P-V Diagram of a Hyperbolic process,
Construction of any conic section of given eccentricity by general method
Construction of ellipse by concentric circles method
Construction of parabola by rectangle method
Construction of rectangular hyperbola
General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering application, viz, Gear tooth profile, screw threads, springs etc. - their construction

6.0 Projection of points, lines and planes & solids

Projecting a point on two planes of projection -Projecting a point on three planes of projection -Projection of straight line.

(a) Parallel to both the planes.
(b) Perpendicular to one of the planes.
(c) inclined to one plane and parallel to other planes

Projection of regular planes

(a) Plane perpendicular to HP and parallel to VP and vice versa.
(c) Plane perpendicular to HP and inclined to VP and vice versa.

Projection of regular solids

(a) Axis perpendicular to one of the planes
(b) Axis parallel to VP and inclined to HP and vice versa.

7.0 Sectional views

Need for drawing sectional views – what is a sectional view - Location of cutting plane – Purpose of cutting plane line – Selection of cutting plane to give maximum information (vertical and offset planes) - Hatching – Section of regular solids inclined to one plane and parallel to other plane

REFERENCE BOOKS

Engineering Graphics by P I Varghese – (McGraw-hill)
Engineering Drawing by Basant Agarwal & C.M Agarwal - (McGraw-hill)
Engineering Drawing by N.D.Bhatt.
T.S.M. & S.S.M on " Technical Drawing" prepared by T.T.T.I., Madras.
SP-46-1998 – Bureau of Indian Standards.

BASIC ELECTRONICS WORKSHOP PRACTICE

Subject title : Basic Electronic Workshop Practice
Subject code : EC-108
Periods per week : 4
Periods / Semester : 60

TIME SCHEDULE

Sl NO	Major Topics	Periods
1	Safety precautions and cleaning	**4**
2	Practice with Tools / Materials	**24**
3	wires, cables , House wiring &Troubleshooting	**32**
	Total	**60**

List of the Experiments

I. Identification of different Tools and Materials and their working

1. Demonstrate the safety precautions and first aid
2. Clean the equipment and Work Tables including Visual inspection and reporting any physical damage
3. Practice with Measuring and Marking Tools
4. Work with different types of screw Drivers.
5. Work With Basic tools
6. Work with Tools used in Electrical Wiring
7. Work with different fastening devices, spanners, wrenches and Allen/ Hex keys
8. Work with Pliers
9. Work with Drilling Machine.
10. Visit the workshop, Identify and observe the function of Grinding machine, Lathe machine, Milling machine and Blower.
11. Practice joining different materials with correct choice of Adhesives .
12. Identify conductors insulating materials semiconductors and magnetic materials

II. Identification of different wires, cables and House wiring

13. Identify different wires and cables
14. Practice wire joints
15. Practice Termination of wires
16. Identify the Electrical accessories and their terminals
17. Identify the mains supply Phase ,Neutral ,Ground By observation and testing
18. Verify the difference between AC and DC by Experimenting with 12 V battery &Transformer
19. Identify and Draw the electrical symbols of the corresponding component /item
20. Make simple switch connections using low voltage transformer and 12V lamp
21. Make either of two lamps glow by two way switch
22. Assemble and connect Tube light set(To be done in the presence of Instructor)
23. Open electrical appliances and identify the parts

Competencies and Key competencies to be achieved

ExpNo	Name of the Experiment (No of Periods)	Competencies	Key Competencies
1	Demonstrate the safety precautions and first aid (2)	➢ Follow the Precautions in the laboratory ,(starting and Stopping of equipment / Machinery) ➢ Identify the symbols and their meaning ➢ Identify the types of emergencies ➢ Follow the sequence of steps to be carried out ➢ Demonstrate basic first aid procedure	▪ Take precautions to prevent accidents in the laboratory ▪ Alert under emergency situations ▪ Give Basic first aid.
2	To Clean the equipment and Work Tables including Visual inspection and	➢ Keep work area clean ➢ Familiarization with equipment	▪ Clean the equipment with appropriate

	reporting any physical damage (2)	➢ Follow the procedure for cleaning with Detergents, Shampoos and solvents. ➢ Follow the precautions to be taken (use of masks, Gloves, Washing hands with soda after cleaning the equipment) ➢ Report any damage of power cords , missing fuses , Low battery in DMMS etc. ➢	cleaning agent. ▪ Report any damage of power cords , missing fuses , Low battery in DMMS etc.
3	To Practice with Measuring and Marking Tools (4)	➢ Use 1.Measuring Tape 2. Steel rule 3.Trysquare 4. Center Punch 5. Plumb ➢ Use the measuring tape to measure a distance of 6 feet and above accurately and mark. ➢ Use the steel rule to measure an odd length given in inches and in millimeters accurately and mark. ➢ Use the Try square to mark perpendicular lines by selecting a finished edge. ➢ Use the centre punch to mark centre points as per the drawing ➢ Use the plumb to observe 1) inclination of wall ii)	▪ Use the right measuring/ marking tool ▪ carry out measurements and marking with precision ▪ Use 1. Try square 2. Centre punch, 3. Plumb

		mark two horizontal points on a wall at a given height and at a given distance.	
4	To Work with different types of screw Drivers. (4) a) Identify 1. Screw Driver b) Flat Head Screwdrivers c) Ratcheting Screwdrivers d) Use the Screw Driver to Remove and Fix wooden Screws e)To Fix and Remove screws of Metal cabinets using correct screw Driver	➢ Select right screw driver ➢ Tightening and removing screws ➢ Work with wood and metal ➢ Handle the screw drivers with care	▪ Select right screw driver ▪ Tighten and remove the screws
5	To Work With Basic tools (4) a) Identify 1.Hacksaw frame/ Blade 2.Ball peen hammers 3. Sledge hammer. 4 Claw hammer 5 Anvil 6 Chisels 7. Bench vice b) Fix the Hacksaw blade in the frame and use it to cut 1) Conduit pipe 2) Cut the Wooden piece with hacksaw frame by fixing it in the bench vice. c) Use a cold chisel to cut the 6mm Rod to required length. d) Use the sledge hammer to bend a 6mm Rod into	➢ identify and select the right Hacksaw frame and blade ➢ Fix the hacksaw blade ➢ Use the hacksaw for cutting metal ➢ Use bench vice for fixing the job ➢ Use hammer with skill ➢	▪ Fix the hacksaw blade ▪ Use the hacksaw for cutting metal ▪ Use hammer with skill

	a ring by striking it on the Anvil e) Drive nails in to a wooden piece with ball peen hammer. f) Remove the Nails using claw hammer		
6	To Work with Tools used in Electrical Wiring (3) A) Identify 1. wire stripper . 2. Insulation remover 3. Pocket knife 5.Electrical Tester 4.Phillips Head Screwdrivers 5. Mallet 6. Rawl plug jumper 7 .Standard wire Gauge b) Use the above tools to remove the insulation. c) Use the mallet to straighten the cable/ Conductor d) Measure the gauge of wire using Standard Wire Gauge. e) Make a hole in the wall for fixing a Screw/ Nail using Raw plug Jumper and ball peen Hammer.	➢ Select right tool, ➢ Remove the insulation without damaging the conductor using 1) Pocket knife 2) Wire stripper ➢ Measure the wire Gauge ➢ Fix a screw in the wall.	▪ Remove the insulation without damaging the conductor using 1) Pocket knife 2) Wire stripper ▪ Measure the wire Gauge ▪ Fix a screw in the wall
7	To Work with different fastening devices, spanners, wrenches and Allen/ Hex keys (4) 1. Identification of	➢ identify various fastening devices by their name and shape ➢ Select the right fastener ➢ Use the spanner for	▪ Use the fastening devices ▪ Work with bolts , nuts and couplings

	different types of fastening devices like Screws, Bolts and Nuts, Rivets, and know their specifications b) Tighten the bolts and nuts using correct type and number of spanner a) Normal b) Ring type , c) Use the Monkey Wrench and Pipe wrench to Tighten GI pipe coupling	tightening and loosening the bolts and nuts ➢ Use the Monkey Wrench and Pipe wrench to Tighten GI pipe coupling	
8	To Work with Pliers (4) a) Identify and use the various features of cutting pliers, Nose pliers, Pipe pliers, Flush cutter, top cutting pliers, Electronics pliers, Insulated cutting pliers b) perform the following operations 1. Holding 2. Wire cutting 3. Component bending 4. Twisting the wire	➢ identify various types of {Pliers by their name and shape ➢ Select the right pliers for a particular job ➢ Perform various operations using pliers	▪ Use the suitable pliers for a given job
9	To Work with Drilling Machine . (2) a) Use the Hand drill to make holes in the wood c) use Electrical hand held hammer drill to make holes in the wall. b . Identify Electrical drilling machine and observe how holes are made in Mild	➢ Identify the parts of Drilling Machine and drill bits used with hand drilling machine ➢ ➢ Fix the drilling bit in the chuck ➢ Follow Safety precautions ➢ Make the drill with precision	▪ Use the drilling machine to make holes

	steel Plates		
10	To Identify and observe the function of Grinding machine , Lathe machine , Milling machine and Blower. (2)	➢ Identify Grinding machines and observe its usage to sharpen cutting tools and Drill bits and for cutting operation on metals. ➢ Identify Lathe machine and observe various operations like turning , taper turning , Knurling , Boring Etc ➢ Identify the milling machine and Know its usage. ➢ identify the Electric Blower and use it for Removing dust and cleaning	▪ Identify the machine and its function. ▪ Identify the processes carried out on the job
11	Practice joining different materials with correct choice of Adhesives (3) a) Practice the use of adhesives like Araldite , Feviquick, Fevicol, Mseal, to join Non metals b) To Use PVC cement to join PVC Pipes	➢ Practice joining using different adhesives ➢ Select right adhesive ➢ Use Quickfixand Feviquick to fix components on PCBs	▪ Join the parts using Araldite, Mseal etc. ▪ Use Quickfixand Feviquick to Fix components on PCBs
12	To Identify conductors insulating materials semiconductors and magnetic materials like (3) 1. Copper , Aluminum , Tin ,Solder Metal .	➢ a)Identify the Copper , aluminum , iron and other metals by physical observation ➢ b)Identify the Insulating materials by their name	▪ identify different conducting and Insulating materials

	2. Plastics, Teflon, PVC, glass, porcelain, ceramic Bakelite, Mica, Paper, Cotton sleeves, Prespahn sheet, Transformer Oil. Etc 3. Carbon rods 4. Iron , Steel, Ferrites	and physical observation	
13	To Identify different wires and cables (1 ½) Identify A).Hookup wires i) PVC wire ii) Teflon wires iii) single strand iv) multi strand B) .Wires used for electrical wiring i) Service wire ii) TRS wires /PVC Wires (Al and Cu) iii) Single strand iv) Multi strand v) twisted Flexible pair wires vi). Enameled copper wire C) i) Power cord. Ii) UTP cables iii) Co axial cables iV) Flat ribbon cable for antennas v) Telephone cable vi)Ethernet cable vii) Ribbon cables viii) Optical fiber	➢ Identify the wires by their technical names ➢ Identify the gauge of the wire ➢ Identify the insulation used and its purpose ➢ Identify the difference between single strand and Multistrand wire ➢ Select a wire for a particular application ➢ Find the current carrying capacity from the gauge of wire (refer to the standard tables)	▪ Identify the type of wire and its current carrying capacity ▪ Measure the wire gauge
14	To Practice wire joints (3) To perform the following wire joints operations a)	➢ Identify the types of joints and state their purpose. ➢ Select the right joint	▪ Make the joint professionally and tape

	Twisting b) Splicing c) Insulating d) Western union joint e) Married joint f) Britania (straight Joint) g) Tee joint h) Joining running cables ,Pigtail or rat tail joint	➢ Remove the insulation ➢ Make the joint ➢ Tape the joint	
15	To Practice Termination of wires (1 ½) a) Using lugs Using screws , nuts Terminal blocks Fixing Fuse wire	➢ Identify different types of terminal blocks ➢ Make connections using lugs,Screws ➢ Fix the fuse wire	▪ Use the terminal Block ▪ Fix the fuse wire
16	To identify the Electrical accessories(1 ½) a) SPST Switch ,SPDT switch , Two pin and 3pin Sockets and plugs ,Power Socket and Power plugs Lamp holders, Ceiling rose, Mains Switch,MCB ,Kitkat Fuse – Fuse wire ratings	➢ Identify different electrical accessories ➢ Identify the item by its shape ➢ Use appropriate electrical accessories	▪ Select appropriate Electrical accessories. ▪ make connections professionally ▪ Work with MCBS KITKAT Fuses
17	To Identify the mains supply Phase ,Neutral ,Ground By observation and testing (3) a) To Repair /prepare 2pin and 3pin power cords	➢ Follow Precautions Identification of Phase Neutral and Earth terminals in mains supply by ➢ 1. By observation 2.Using Tester 3 .Using Test Lamp 4. Using DMM ➢ Make 2pin and 3pin Plug connections ➢ Make Power socket and switch connections	▪ Identify phase and Neutral terminals in mains supply with tester ▪ Identify Earth connections with Test lamp

		➢ Test the earth connection	
18	To verify the difference between AC and DC by Experimenting with 12 V battery &Transformer (3) 1. To Verify unidirectional current flow 2. To Verify the effects of polarity 3. To Determine polarity using a Voltmeter /LED 4. To verify reversal of current using battery and DPDT switch	➢ To Check the polarity of DC voltage source ➢ Find the polarity in DC circuits by using MC Voltmeter ➢	▪ Check the source type (AC/DC) ▪ Finding polarity in DC circuits using DC Voltmeter/LED ▪
19	To Identify and Draw the electrical symbols of the corresponding component /item(1 ½)	➢ Identify the physical component from the symbol	▪ Identify the physical component from the symbol
20	To Make simple switch connections using low voltage transformer and 12V lamp(1 ½) 1. Connecting a 6V lamp to a switch (toggle) 2. 2 way switch connections 3. Series and parallel connection of lamps	➢ Make the simple Switch connections ➢ use the two way switch for stair case wiring and ➢ Series and parallel connection of lamps	▪ Use the switch for controlling lamp circuits ▪ Use Two way switches for stair case wiring and other controls
21	To Make either of two lamps glow by two way switch(1 ½) 5. Bright and Dim light	➢ Make two way Switch circuit connections ➢ Use two way switch for controlling lamps.	▪ Use two way switch circuits for controlling different circuits and

	arrangement (using a series lamp / using a Diode) 6.either two lamps bright or two lamps dim		equipment.
22	To assemble and connect Tube light set(To be done in the presence of Instructor) (1 ½) b)To test the Effect of Low Voltage On tube light (Instructor applies low voltage With an auto Transformer) c) To start the tube light with starter removed. d) To Open the choke cover and observe the constructional details e) To connect a CFL Lamp and draw comparison	➢ Identify the parts of tube light set ➢ Make tube light connections ➢ Identify the Choke and starter ➢ Observe the behavior of tubelight under low voltage conditions ➢ Open and observe the construction of choke ➢ Verify the purpose of starter ➢ Observe the CFL lamp	▪ Make tube light connections

PHYSICS LAB - I

(Common for all branches)

Subject Title	**:**	**Physics Lab - I**
Subject Code	**:**	**EC -109**
Periods per week	**:**	**03**
Total periods per semester	**:**	**22**

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Hands on practice on Vernier Calipers	03
2.	Hands on practice on Screw gauge	03
3.	Verification of Parallelogram law of forces and Triangle law of forces	03
4.	Boyle's law verification	03
5.	Refractive index of solid using traveling microscope	03
6.	Meter bridge	03
	Revision	02
	Test	02
	Total:	**22**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practice the Vernier caliper to determine the volume of a cylinder and sphere

2.0 Practice the Screw gauge to determine thickness of a glass plate and cross section of a wire

3.0 Verify the parallelogram law and Triangle law of forces.

4.0 Verify the Boyle's law employing a Quill tube

5.0 Determine the refractive index of a solid using travelling microscope

6.0 Determine the specific resistance of wire material using Meter Bridge

Competencies and Key competencies to be achieved by the student

Name of the Experiment **(No of Periods)**	**Competencies**	**Key competencies**
1. Hands on practice on Vernier Calipers(03)	• Find the Least count • Fix the specimen in position • Read the scales • Calculate the volume of given object	• Read the scales • Calculate the volume of given object
2. Hands on practice on Screw gauge(03)	• Find the Least count • Fix the specimen in position • Read the scales • Calculate thickness of glass plate and cross section of wire	• Read the scales • Calculate thickness of given glass plate • Calculate cross section of wire
3. Verification of Parallelogram law of forces and Triangle law of forces(03)	• Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle • Find the length of sides • Compare the ratios	• Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length

4. Boyle's law verification (03)	• Note the atmospheric pressure • Fix the quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated value P x l	• Find the length of air column • Find the pressure of enclosed air • Find the value P x l
5. Refractive index of solid using traveling microscope(03)	• Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab	• Read the scale • Calculate the refractive index of glass slab
6. Meter bridge(03)	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific resistance	• Find the balancing length • Calculate unknown resistance • Calculate the specific resistance

CHEMISTRY LAB - I

(Common for all branches)

Subject Title : **Chemistry Lab - I**

Subject Code : **EC-110**

Periods per week : **03**

Total periods per semester : **22**

TIMESCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Familiarization of methods of Volumetric Analysis	03
2.	Preparation of Std Na_2CO_3 solution and making solutions of different dilution	03
3.	Estimation of HCl solution using Std. Na_2CO_3 solution	03
4.	Estimation of NaOH using Std. HCl solution	03
5.	Estimation of H_2SO_4 using Std. NaOH solution	03
6.	Estimation of Mohr's Salt using Std. $KMnO_4$	03
	Revision	02
	Test	02
	Total:	**22**

*C**OMPUTER FUNDAMENTALS LAB -1***

(Common To All Branches)

Subject Title : Computer Fundamentals Lab - 1
Subject Code : EC - 111
Periods/Week : 3
Periods/Semester : 45

LIST OF EXPERIMENTS

1.0 BASICS

1.1. Identify the various components of a Computer system

1.2. Differentiate between hardware and software

1.3. State the configuration of a computer system

1.4. Exercise on creation of Text Files using Notepad, WordPad

1.5. Exercise on creation of .jpeg, .bmp Files using MS Paint

1.6. Exercise how to use calculator

2.0 DOS Operating System

2.1. Practice on Internal and External commands.

2.2. Create and use Batch Files.

2.3. Know the usage of Editors.

3.0 WINDOWS Operating System

3.1. Exercise on creation of folders and organizing files in different folders

3.2. Exercise on use of Recycle Bin

3.3. Exercise on use of My Computer and My Documents

3.4. Exercise on creation of shortcut to files and folders (in other folders) on Desktop

3.5. Exercise on arranging of icons – name wise, size, type, Modified

3.6. Exercise on searching of files and folders

3.7. Exercise on using of explorer for accessing of files and folders

3.8. Exercise on organizing files / folders using copy and paste of files and folders

3.9. Change resolution, colour, appearance, screen server options of Display

3.10. Change the system date and time.

4.0 Internet

4.1. Importance of web browser software

4.2. Structure of URL

4.3. Create an E-mail account

4.4. Send an E-mail

4.5. Receive an E-mail

4.6. Browse the Internet using various search engines

OBJECTIVES AND KEY COMPETENCIES

S. No	Name of Experiment	Objectives	Key Competencies
1.	Identify the various components of a Computer system	➢ Identify various Components of a System	❖ Check whether components are identified correctly ❖ Identify all components inside computer ❖ Identify all Peripherals connected ❖ Observe the functionality of all components like CPU, RAM, HDD, FDD, Motherboard
2.	Differentiate between hardware and software	➢ To Differentiate between hardware and software	❖ Observe differences between hardware and software
3.	State the configuration of a computer system	➢ Able to observe configuration of given system	❖ Use System icon in control panel ❖ Use system information in Accessories
4.	Practice on Internal and External commands.	➢ To use internal commands ➢ To use External commands	❖ Check whether able to use all internal commands using DOS ❖ Check whether able to use all external commands using DOS
5.	Create and use Batch Files.	➢ Able to create Batch files ➢ Able to create Autoexe.bat file	❖ Check whether able to create by taking set files in creating batch file ❖ Check whether able to create AUtoexe.bat file properly
6.	Know the usage of Edline Editor	➢ Able to use edline command to create a file ➢ Able to edit a file using edline command	❖ Check whether able to use edline command in DOS environment ❖ Check whether able to edit a file using edline command
7.	Exercise on creation of folders and organizing files in different folders	➢ Able to create folder ➢ Able to organize file in different folders	❖ Check whether able to create folder using right click on desktop ❖ Check whether able to create folder using windows explorer ❖ Observer in organizing files in different folders using windows explorer ❖ Observer in organizing files in different folders using My Computer

8.	Exercise on creation of .jpeg, .bmp Files using MS Paint	➢ Able to create picture file in .jpeg format ➢ Able to create picture file in .bmp format	❖ Check whether able to create picture file .jpeg format properly ❖ Check whether able to create picture file in .bmp format properly
9.	Exercise on using Recycle Bin	➢ Able to Use Recycle Bin	❖ Check Recycle bin whether able to use delete files ❖ Observe files were properly restored files
10.	Exercise on use of My Computer and My Documents	➢ Able to Access files and folders in C: Drive ➢ Able Access files and folders in other drives ➢ Able to use My Documents so that organize and access files and folders in it ➢ Able to use My Documents so that Organizing files in My Music, My Pictures, My Videos ➢ Able to create short cut for My Documents on desktop properly	❖ Check whether able to access files in C: Drive using My Computer correctly or not ❖ Check whether able to access files in other drives using My Computer correctly or not ❖ Check whether able use CD/DVD drive using My Computer ❖ Check whether able to organize files and folders in My Documents ❖ Check Whether able to organize files in My Music, My Pictures, My Videos in My Documents ❖ Check able to create short cut for My Documents on desktop properly
11.	Exercise on creation of shortcut to files and folders (in other folders) on Desktop	➢ Able to create shortcut of files and folders on desktop	❖ Check whether can able to create shortcut for any files created on desktop ❖ Check whether can able to create shortcut for any folder created on desktop
12.	Exercise on arranging of icons – name wise, size, type, Modified	➢ Able to arranging of icons – name wise, size, type, Modified on desktop	❖ Observe whether able to arrange of icons – name wise, size, type, Modified
13.	Exercise on searching of files and folders	➢ Able to search of files and folders	❖ Check searching of files and folders
14.	Exercise on using of explorer for accessing of files and folders	➢ Able to use of explorer for accessing of files and folder	❖ Check use of explorer for accessing of files and folders
15.	Exercise on organizing files / folders using copy	➢ Able to organizing files / folders using copy and paste of files and folders using explorer	❖ Check organizing files / folders using copy and paste of files and folders

	and paste of files and folders	Able to organizing files / folders using copy and paste of files and folders using My Computer	❖ Check organizing files / folders using copy and paste of files and folders using my computer
16.	Exercise using Calculator from Accessories and through Run	Able to use calculator in Standard mode Able to use calculator in Scientific mode	❖ Check calculator in Standard mode ❖ Check calculator in Scientific mode
17.	Exercise on shutdown of computer system	Able to shutdown of computer system	❖ Check shutdown of computer system
18.	Exercise on understanding the use of Taskbar	Able to understand the use of Taskbar by opening some applications	❖ Check the use of Taskbar by opening some applications
19.	Exercise on using of Internet Explorer or any other browser	Able to use of Internet Explorer Able to use of Mozilla Firefox Able to use of Google Chrome Able to use of opera	❖ Check use of Internet Explorer ❖ Check use of Mozilla Firefox ❖ Check use of Google Chrome ❖ Check use of opera
20.	Change resolution, color, appearance, screen server options of Display	Able to change resolution, color, appearance, screen server options of Display	❖ Check resolution, color, appearance, screen server options of Display
21.	Change the system date and time	Able to change system date and time	❖ Check change system date and time
22.	Create an E-mail account	Able to create an E-mail account	❖ Check able to create an E-mail account
23.	Send an E-mail	able to send an E-mail	❖ Check able to send an E-mail
24.	Receive an E-mail	able to receive an E-mail	❖ Check able to receive an E-mail
25.	Browse the Internet using various search engines	Able to search for a content in the Internet using various search engines	❖ Check able to search for a content in the Internet using various search engines

I I SEMESTER

C-16 SCHEME OF INSTITUTIONS AND EXAMINATIONS II SEMESTER- DECE								
		Institution periods/week		Scheme of Examination				
Subject Code	Name of the subject	Theory	Practical	Periods	Duration(Hours)	Sessional marks	End exam marks	Total marks
THEORY SUBJECTS								
EC-201	English	3		45	3	20	80	100
EC-202	Engineering mathematics-I	5		75	3	20	80	100
EC-203	Engineering Physics	4		60	3	20	80	100
EC-204	Engineering Chemistry & Environmental studies	4		60	3	20	80	100
EC-205	Basic Electronics-2	5		75	3	20	80	100
EC-206	Electrical Technology	5		75	3	20	80	100
PRACTICAL SUBJECTS								
EC-207	Engineering Drawing		6	90	3	40	60	100
EC-208	Electrical & Electronics Engineering Workshop		4	60	3	40	60	100
Ec-209	Physics Lab		3	45	1.5	20	30	50
EC-210	Chemistry Lab				1.5	20	30	50
EC-211	Computer Fundamentals Lab		3	45	3	40	60	100
	Total	26	16	630		280	720	1000

English for Polytechnics

(Common to All the Branches)
Second Semester

Subject Code : EC-201
No. of periods per week : 3
No. of periods per year : 45

Objectives and Key Competencies

Sl. No.	Name of the Unit	Objectives	Key Competencies
01	**Expressing Obligations**	• Express obligation • Express an order or a strong suggestion	• Learn the words to express suggestion and obligation • Express suggestions and obligations
02	**Fixing and Cancelling Appointments**	• Fix appointments • Reschedule or cancel appointments	• Know the importance of appointment • Learn expressions used in fixing an appointment • Know the ways of rescheduling and cancelling appointments
03	**Extending and Accepting Invitations**	• Extend invitations • Accept invitations	• Identify the phrases used to extend and accept invitations • Practise a few ways of extending invitations • Learn the expressions used for accepting invitations
04	**Giving Instructions**	• Understand instructions • Give instructions	• Know the need to give instructions • Learn the steps involved in giving instructions • Practise giving instructions
05	**Asking for and Giving**	• Ask for directions • Give directions	• Know the words and phrases used often in giving directions

	Directions		• Learn how to ask for and give directions • Know the common errors in giving directions
06	**Describing Words**	• Listen for general comprehension • Listen for specific details • identify adjectives and know what an adjective is • use adjectives accurately	• Listen for main idea and minute details • Learn several adjectives • Know the common errors in the use of adjectives
07	**The Here and Now**	• Listen for general comprehension • Listen for specific details • identify prepositions and understand what prepositions are • Use prepositions	• Listen for main idea and minute details • Learn the prepositions of place • Learn the prepositions of time • Learn the common errors in the use of prepositions
08	**An Environmental Challenge**	• Comprehend the main idea • Learn new words	• Learn how to identify the central idea • Learn some new words
09	**The Will to Succeed**	• Understand the main idea • Learn narrative style of writing	• Know the secret of success of a woman entrepreneur • Know the narrative style of writing • Learn new words
10	**Waiting for Mr. Clean**	• Understand the main idea • Identify conversational style of writing • Learn new words	• Learn to note down the central idea of a paragraph • Learn new words
11	**Reported Speech**	• Understand what reported speech is • Report something spoken by others	• Learn two ways of reporting a speaker's words • Learn how to change from direct speech to indirect speech

12	**Error Analysis-I**	• Identify common errors in sentences • Correct errors in the usage of nouns, pronouns and verbs	• Know the various errors in spoken and written English • Identify the common errors • Correct the errors in nouns, pronouns and verbs
13	**Error Analysis – II**	• Identify the errors in usage of English • Correct errors in the usage of articles, adjectives, adverbs, prepositions and conjunctions	• Correct the errors in the usage of articles, adjectives, adverbs, prepositions and conjunctions • Rewrite a paragraph correcting the errors
14	**Error Analysis – III**	• Correct errors in vocabulary, questions, subject-verb agreement, homophones • Identify errors of redundancy	• Correct the errors in the usage of vocabulary and in framing questions • Correct the errors in concord and redundancy
15	**Data Interpretation - I**	• Study and understand the information in flow charts • analyse/interpret flow charts • Write a paragraph using the data given	• Study the data given in flow charts • analyse the data given in flow charts • Write a paragraph using the data given
16	**Data Interpretation – II**	• Understand the information in a tree diagram • Analyse the data • Write a paragraph using the data given	• Study the data given in tree diagrams • analyse the data given in tree diagrams • Write a paragraph using the data given
17	**Data Interpretation – III**	• Understand the data in the table • Present the data given in a table • Write a paragraph using he data given	• Study the data given in tables • analyse the data given in tables • Write a paragraph using the data given
18	**Resume**	• Understand what a resume	• Learn the salient features of

		is • Prepare a resume	a resume • Observe a sample resume given • Prepare a resume
19	**Cover Letter**	• Understand what a cover letter is • Write a cover letter	• Know the importance of a cover letter • Read the sample cover letter • Write a cover letter
20	**Note Making**	• Identify important words and ideas in a text • Learn how to make notes using the cue method	• Know the importance of making notes • Look for the key words given in the text • Observe the sample outline using cue method • Make notes using cue and mapping methods
21	**Writing a Report**	• Understand the format of a report of an industrial visit • Write a report using the format	• Learn the various kinds of reports • Observe the format of a report of an industrial visit • Learn the tips to write a report • Write a report

Weightage Table

Sl. No	Module	Short Questions	Essay questions
1	Speaking	8	1
2	Grammar	12	--
3	Reading	---	2
4	Writing	---	5

ENGINEERING MATHEMATICS - II

(Common to all branches)

Subject title	**:**	**Engineering Mathematics-II**
Subject code	**:**	**EC-202**
Periods per week	**:**	**5**
Total Periods per Semester	**:**	**75**

Time Schedule with BLUEPRINT

S. No	Major Topic	No of Periods		Weightage of Marks	Short Type			Essay Type		
S.No	**Unit-I Co-ordinate Geometry**	**Theory**	**Practice**		**R**	**U**	**App**	**R**	**U**	**App**
1	Straight Lines	6	2	13	2	2	0	0	1/2	0
2	Circle	6	2	13	2	2	0	0	1/2	0
	Unit -II Differential Calculus									
3	Limits and Continuity	6	2	10	2	3	0	0	0	0
4	Differentiation	20	10	48	2	2	0	2	2	0
	Unit -III Applications of Differentiation									
5	Geometrical Applications	8	3	19	2	0	0	0	1/2	1
6	Maxima and Minima	7	3	17	1	0	0	0	1/2	1
	Total	53	22	120	11	9	0	2	4	2
	Marks				22	18	0	20	40	20

R:	**Remembering type**	**:**	42 marks
U:	**Understanding type**	**:**	58 marks
App:	**Application type**	**:**	20 marks

Objectives

Upon completion of the course the student shall be able to:

UNIT - I

Coordinate Geometry

1.0 Solve the problems on Straight lines

1.1 Write the different forms of a straight line – point slope form, two point form, intercept form, normal form and general form

1.2 Solve simple problems on the above forms

1.3 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

2.0 Solve the problems on Circles

2.1 Define locus of a point – circle and its equation.

2.2 Find the equation of a circle given

- (i) Center and radius
- (ii) Two ends of a diameter
- (iii) Centre and a point on the circumference
- (iv) Three non-collinear points
- (v) Centre and tangent

2.3 Write the general equation of a circle and find the Centre and radius.

2.4 Write the equation of tangent and normal at a point on the circle.

2.5 Solve the problems to find the equations of tangent and normal.

UNIT - II

Differential Calculus

3.0 Use the concepts of Limit and Continuity for solving the problems

3.1 Explain the concept of limit and meaning of $\lim_{x \to a} f(x) = l$ and state the properties of limits.

3.2 Mention the Standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0}\frac{\tan x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, $\lim_{x\to 0}\frac{e^x-1}{x}$, $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$, $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ (All without proof).

3.3 Solve the problems using the above standard limits

3.4 Evaluate the limits of the type $\lim_{x\to l}\frac{a x^2+b x+c}{\alpha x^2+\beta x+\gamma}$ and $\lim_{x\to\infty}\frac{f(x)}{g(x)}$

3.5 Explain the concept of continuity of a function at a point and on an interval with some examples whether a given function is continuous or not.

4.0 Appreciate Differentiation and its meaning in engineering situations

4.1 State the concept of derivative of a function y = f(x) – definition, first principle as $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

4.2 State the significance of derivative in scientific and engineering applications.

4.3 Find the derivatives of elementary functions like x^n , a^x, e^x, log x, sin x, cos x, tanx, Secx, Cosecx and Cot x using the first principles.

4.4 Find the derivatives of simple functions from the first principle.

4.5 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.

4.6 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples such as

(i) $\sqrt{t^2+\frac{2}{t}}$ **(ii)** $x^2\sin 2x$ **(iii)** $\frac{x}{\sqrt{x^2+1}}$ **(iv)** $\log\left(\sin(\cos x)\right)$.

4.7 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations.

4.8 Explain the method of differentiation of a function with respect to another function and also differentiation of parametric functions with examples.

4.9 Find the derivatives of hyperbolic functions.

4.10 Explain the procedures for finding the derivatives of implicit function with examples.

4.11 Explain the need of taking logarithms for differentiating some functions with examples like $[f(x)]^{g(x)}$.

4.12 Explain the concept of finding the higher order derivatives of second and third order with examples.

4.13 Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple examples.

4.14 Explain the definition of Homogenous function of degree n

4.15 Explain Euler's theorem for homogeneous functions with applications to simple problems.

UNIT - III

Applications of the Differentiation

5.0 Understand the Geometrical Applications of Derivatives

5.1 State the geometrical meaning of the derivative as the slope of the tangent to the curve y=f(x) at any point on the curve.

5.2 Explain the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve y=f(x) at any point on it.

5.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve y=f(x).

5.4 Explain the concept of angle between two curves and procedure for finding the angle between two given curves with illustrative examples.

6.0 Use Derivatives to find extreme values of functions

6.1 Define the concept of increasing and decreasing functions.

6.2 Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.

6.3 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable - simple problems yielding maxima and minima.

6.4 Solve problems on maxima and minima in applications like finding areas, volumes, etc.

COURSE CONTENT

UNIT-I

Coordinate geometry

1. Straight lines: various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.

2. Circle: locus of a point, Circle definition-Circle equation given (i) center and radius, (ii) two ends of a diameter (iii) Centre and a point on the circumference (iv) three non collinear points and (v) Centre and tangent equation - general equation of a circle - finding center, radius: tangent, normal to circle at a point on it.

UNIT-II

Differential Calculus

3. Concept of Limit- Definition- Properties of Limits and Standard Limits -Simple Problems- Continuity of a function at a point- Simple Examples only.
4. Concept of derivative- definition (first principle)- different notations-derivatives of elementary functions - problems. Derivatives of sum, product, quotient, scalar multiplication of functions - problems. Chain rule, derivatives of inverse trigonometric functions, derivative of a function with respect to another function, derivative of parametric functions, derivative of hyperbolic, implicit functions, logarithmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables – partial differentiation, Euler's theorem-simple problems.

UNIT-III

Applications of Derivatives:

5. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, sub tangent and subnormal to the curve at any point. Angle between the curves - problems.
6. Applications of the derivative to find the extreme values – Increasing and decreasing functions, finding the maxima and minima of simple functions - problems leading to applications of maxima and minima.

Reference Books:

1. Co-ordinate Geometry, by S.L Loney
2. Thomas Calculus, Pearson Addison-Wesley publishers
3. Calculus – I, by Shanti Narayan and Manicavachgam Pillai, S.V Publications

ENGINEERING PHYSICS-II

Subject Title : Engineering Physics - II
Subject Code : EC -203
Periods per week : 04
Total periods per semester : 60

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type (2 marks)	Essay Type (10 marks)
1.	Friction	08	14	2	1
2.	Work, Power and Energy	10	18	4	1
3.	Simple Harmonic Motion	12	28	4	2
4.	Sound	12	26	3	2
5.	Properties of matter	06	06	3	-
6.	Electricity & magnetism	12	28	4	2
	Total:	**60**	**120**	**20**	**8**

INTERNAL ASSESSMENT

UNIT TEST 1 : UNITS 1,2 and 3

UNIT TEST 2 : UNITS 4,5 and 6

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Friction

1.1 Define friction and state its causes
1.2 Classify the types of friction
1.3 Explain the concept of Normal reaction
1.4 State the laws of friction
1.5 Define coefficients of friction
1.6 Explain the Angle of friction
1.7 Derive an expression for acceleration of a body on a rough horizontal surface
1.8 Derive an expression for the displacement and time taken to come to rest over a rough horizontal surface
1.9 List the Advantages and Disadvantages of friction
1.10 Mention the methods of minimizing friction
1.11 Solve the related numerical problems

2.0 Understand the concept of Work, Power, and Energy

2.1 Define the terms Work, Power and Energy.
2.2 State SI units and dimensional formula for Work, Power, and Energy
2.3 Define potential energy
2.4 Derive an expression for Potential energy with examples
2.5 Define kinetic energy
2.6 Derive an expression for kinetic energy with examples
2.7 State and prove Work- Energy theorem
2.8 Explain the relation between Kinetic energy and momentum
2.9 State the law of conservation of energy
2.10 Verify the law of conservation of energy in the case of a freely falling body
2.11 Solve the related numerical problems

3.0 Understand the concept of Simple harmonic motion

3.1 Define Simple harmonic motion
3.2 State the conditions of Simple harmonic motion
3.3 Give examples for Simple harmonic motion
3.4 Show that the tip of the projection of a body moving in circular path with uniform speed is SHM
3.5 Derive an expression for displacement of a body executing SHM
3.6 Derive an expression for velocity of a body executing SHM
3.7 Derive an expression for acceleration of a body executing SHM
3.8 Derive expressions for Time period and frequency of S H M
3.9 Define phase of S H M
3.10 Derive expression for Time period of a simple pendulum
3.11 State the laws of simple pendulum
3.12 Explain seconds pendulum
3.13 Solve the related numerical problems

4.0 Understand the concept of Sound

4.1 Define the term sound
4.2 Explain longitudinal and transverse wave motion
4.3 Distinguish between musical sound and noise
4.4 Explain noise pollution and state SI unit for noise
4.5 Explain causes of noise pollution
4.6 Explain effects of noise pollution
4.7 Explain methods of minimizing noise pollution
4.8 Explain the phenomenon of beats
4.9 List the applications of beats
4.10 Define Doppler effect
4.11 List the Applications of Doppler effect
4.12 Explain reverberation and reverberation time
4.13 Write Sabine's formula
4.14 Explain echoes
4.15 State conditions of a good auditorium
4.16 Solve the related numerical problems

5.0 Understand the properties of matter

5.1 Define terms Elasticity and plasticity
5.2 Define the terms stress and strain
5.3 State the units and dimensional formulae for stress and strain

5.4 State the Hooke's law
5.5 Define the surface tension
5.6 Explain Surface tension with reference to molecular theory
5.7 Define angle of contact
5.8 Define capillarity and state examples
5.9 Write the formula for surface tension based on capilarity
5.10 Explain the concept of Viscosity
5.11 Provide examples for surface tension and Viscosity
5.12 State Newton's formula for viscous force
5.13 Define co-efficient of viscosity
5.14 Explain the effect of temperature on viscosity of liquids and gases
5.15 State Poiseulle's equation for Co-efficient of viscosity
5.16 Solve the related numerical problems

6.0 Understand the concept of Electricity and Magnetism

6.1 Explain the concept of Electricity
6.2 State the Ohm's law
6.3 Explain the Ohm's law
6.4 Define specific resistance, conductance and their units
6.5 State Kichoff's laws
6.6 Explain Kichoff's laws
6.7 Describe Wheatstone's bridge with legible sketch
6.8 Derive an expression for balancing condition of Wheatstone's bridge
6.9 Explain the basic concept of Meter Bridge with legible sketch
6.10 Explain the concept of magnetism
6.11 State the Coulomb's inverse square law of magnetism
6.12 Define magnetic field and magnetic lines of force
6.13 State the Magnetic induction field strength-units and dimensions
6.14 Describe the moment of couple on a bar magnet placed in a uniform magnetic field
6.15 Solve the related numerical problems

COURSE CONTENT

1. Friction:

Introduction to friction- Causes- Types of friction- Laws of friction -Angle of friction— Motion of a body over a horizontal surface- Advantages and disadvantages of friction- Methods of reducing friction – Problems

2. Work, Power and Energy:

Work, Power and Energy- Definitions and explanation- potential energy- kinetic energy- Derivations of Potential and Kinetic energies-K.E and Momentum relation - Work-Energy theorem- Law of Conservation of energy- Problems

3. Simple Harmonic Motion:

Introduction- Conditions of SHM- Definition- Examples- Expressions for displacement, velocity, acceleration, Time period, frequency and phase in SHM- Time period of a simple pendulum- Laws of simple pendulum-seconds pendulum- Problems

4. Sound:

Sound- Nature of sound- Types of wave motion - Musical sound and noise- Noise pollution – Causes & effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation-Reverberation time-Sabine‘s formula-Condition of good auditorium- Problems

5. Properties of matter

Definition of Elasticity –Definition of stress and strain -the units and dimensional formulae for stress and strain-The Hooke’s law- Definition of surface tension- Explanation of Surface tension with reference to molecular theory - Definition of angle of contact - Definition of capillarity -The formula for surface tension based on capillarity - Explanation of concept of Viscosity - Examples for surface tension and Viscosity - Newton’s formula for viscous force- Definition of co-efficient of viscosity- The effect of temperature on viscosity of liquids and gases - Poiseulle’s equation for Co-efficient of viscosity- The related numerical problems

6. Electricity & Magnetism:

Ohm’s law and explanation- Specific resistance- Kirchoff’s laws- Wheatstone’s bridge - Meter bridge- Coulomb’s inverse square law- magnetic field- magnetic lines of force-Magnetic induction field strength-moment of couple-problems.

REFERENCE BOOKS

1. Intermediate physics Volume- I & 2	Telugu Academy
2. Text book of physics	Resnick & Holiday
3. Engineering physics	Gaur and Gupta
4. Fundamental Physics Volume -1 & 2	K.L.Gomber and K.L.Gogia

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES- II

Subject Title : Engineering Chemistry and Environmental Studies- II
Subject Code : EC-204
Periods per week : 04
Total periods per semester : 60

TIMESCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type (2 marks)	Essay Type (10 marks)
1.	PRINCIPLES OF METALLURGY	10	16	3	1
2.	ELECTRO CHEMISTRY	14	30	5	2
3.	CORROSION	08	14	2	1
4.	POLYMERS	12	28	4	2
5.	FUELS	06	14	2	1
6.	ENVIRONMENTAL STUDIES	10	18	4	1
	Total:	**60**	**120**	**20**	**8**

1.0 Principles of Metallurgy

1.1 List the Characteristics of Metals.

1.2 Distinguish between Metals and Non Metals

1.3 Define the terms 1.Mineral, 2.Ore, 3. Gangue, 4.Fluxand 5.Slag

1.4 Describe Froth Floatation method of concentration of ore.

1.5 Describe the methods involved in extraction of crude metal- Roasting, Calcination and Smelting.

1.6 Explain the purification of Metals by Electrolytic Refining

1.7 Define an Alloy

1.8 Write the Composition of the following alloys:1.Brass, 2.Germansilver, and Nichrome

1.9 List the uses of following Alloys: Brass, German silver, Nichrome

2.0 Electrochemistry

2.1 Define the terms1. conductor, 2. Insulator, 3.Electrolyteand 4.Non–electrolyte

2.2 Types of electrolytes.- strong and weak with examples.

2.3 Distinguish between metallic conductors and Electrolytic conductors.

2.4 Explain Arrhenius theory of electrolytic dissociation

2.5 Explain electrolysis of fused NaCl.

2.6 ExplainFaraday'slawsofelectrolysis

2.7 Define Chemicalequivalent, Electrochemicalequivalent.

2.8 Solve the NumericalproblemsbasedonFaraday'slawsofelectrolysis

2.9 DefineGalvaniccell

2.10 Explain the construction and working of Galvaniccell

2.11 Distinguishbetweenelectrolyticcellandgalvaniccell

2.12 Explain thestandardelectrodepotentials

2.13 Defineelectrochemicalseriesand explainitssignificance.

2.14 Define and explainemfofacell.

2.15 Solve the numericalproblemsonemfofcell

3.0 Corrosion

3.1 Define the term corrosion

3.2 Explain the Factorsinfluencingtherateofcorrosion

3.3 Explaintheconceptofelectrochemicaltheoryofcorrosion

3.4 Describetheformationofa)compositioncell,b)stresscell c)concentrationcell

3.5 Define rust and explainthemechanismofrustingofiron with equations.

3.6 Explainthemethodsofpreventionofcorrosion: a)Protectivecoatings

b) Cathodicprotection(SacrificialanodeprocessandImpressed–voltage process)

4.0 Polymers

4.1 Explain theconceptofpolymerisation

4.2 Describe the methods of polymerisationa) addition polymerisationb) condensation polymerization with examples.

4.3 Definethetermplastic

4.4 Types of plasticswithexamples.

4.5 Distinguishbetweenthermoplasticsandthermosettingplastics

4.6 List the Characteristicsofplastics.

4.7 State the advantagesof plasticsovertraditionalmaterials

4.8 State the disadvantagesofusingplastics.

4.9 Explain the methodsofpreparation and uses of the followingplastics:

1.Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde 6. Bakelite (only flow chart i.e. without chemical equations).

4.10 Definethetermnaturalrubber

4.11 StatethestructuralformulaofNaturalrubber

4.12 ExplaintheprocessingofNaturalrubberfrom latex

4.13 List the Characteristicsofnaturalrubber

4.14 ExplaintheprocessofVulcanization

4.15 List the CharacteristicsofVulcanizedrubber

4.16 DefinethetermElastomer

4.17 Describe the preparation and uses of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c)Neoprenerubber

5.0 Fuels

5.1 Definethetermfuel

5.2 Classify thefuelsbasedonphysicalstate –solid, liquidandgaseous fuels with examples.

5.3 Classify thefuelsbasedonoccurrence-primaryandsecondaryfuels with examples.

5.4 List the characteristicsof a goodfuel.

5.5 Statethecompositionandusesof the following gaseousfuels: a)watergas, b)producergas, c)naturalgas, d)coalgas, e)Biogas and f) acetylene

6.0. ENVIRONMENTALSTUDIES

6.1. Defineairpollution

6.2 Classify the airpollutants-basedonoriginandstateofmatter

6.3 Explainthecausesofairpollution

6.4 Explaintheuseandoverexploitationofforestresourcesanddeforestation

6.5 Explaintheeffectsofairpollutiononhumanbeings,plantsandanimals

6.6 Explainthegreenhouseeffect -ozonelayerdepletionandacidrain

6.7 Explainthemethodsofcontrolofairpollution

6.8 Definewaterpollution

6.9 Explainthecausesofwaterpollution

6.10 Explaintheeffectsofwaterpollutiononlivingandnonlivingthings

6.11 Understandthemethodsofcontrolofwaterpollution.

COURSE CONTENT

1. PrinciplesofMetallurgy

Characteristics of Metals and distinctions between Metals and Non Metals, Metallurgy, ore, Gangue, Flux, Slag - Concentration of Ore –Froth floatation - Methods of Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of Brass, German silverandNichrome

2. Electrochemistry

Conductors, insulators, electrolytes - Arrhenius theory of electrolytic dissociation – electrolysis – Faraday's laws of electrolysis- numerical problems – Galvanic cell – standard electrode potential – electro chemical series– emfandnumericalproblemsonemfofacell

3. Corrosion

Introduction - factors influencing corrosion - electrochemical theory of corrosion-

composition,stressandconcentrationcells–rustingofiron and its mechanism – prevention of corrosion by coating methods, cathodic protection

4. Polymers

Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials – Disadvantages of using plastics – preparationandusesofthefollowingplastics:1.Polytehene2.PVC 3.Teflon 4.Polystyrene 5.Urea formaldehyde 6. Bakelite – Rubber – Natural rubber – processing from latex – Vulcanization – Elastomers – Butyl rubber, Buna-s, Neoprene rubberandtheiruses.

5. Fuels

Definitionandclassificationoffuels–characteristicsofgoodfuel-compositionand usesofgaseousfuels- a)watergas,b)producergas, c)naturalgas, d)coalgas, e)Biogas and f) acetylene

6. ENVIRONMENTALSTUDIES

airpollution-causes-Effects– forestresources:uses and over exploitation, deforestation, acid rain, green house effect –ozone depletion – control of air pollution – Water pollution – causes – effects – controlmeasures

INTERNAL ASSESSMENT

UNIT TEST 1 : UNITS 1,2 and 3

UNIT TEST 2 : UNITS 4 and 5

REFERENCEBOOKS

1. Intermediate chemistry Vol 1&2 Telugu Acedemy
2. Engineering Chemistry Jain & Jain
3. Engineering Chemistry O.P. Agarwal, Hi-Tech.
4. Engineering Chemistry Sharma
5. Engineering Chemistry A.K. De

BASIC ELECTRONICS-II

Subject Title : Basic Electronics-I
Subject Code : EC-205
Periods/Week : 05
Periods/Year : 75

TIME SCHEDULE

Sl. No	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Electronic Assembly of Tools, and joining of Metals	10	4	2	-
2	Microphones and Loudspeakers	10	14	2	1
3	Semiconductor Materials and Diodes	15	14	2	1
4	Transistors	20	14	2	1
5	DC Power supplies	20	14	2	1
	Total	75	120	20	8

1.0 Understand the electronic assembly of tools and Joining of metals in Electronic Industry

1.1. List at least ten important hand tools used in the Electronic work shop.

1.2. List the types of hammers.

1.3. List various important hand Files used in the electronic workshop
1.4. List the types of Screw Drivers used in the Electronic workshop
1.5. Mention the use of adhesives..
1.6. Classify adhesives
1.7. List the types of Screw Drivers used in the Electronic workshop.
1.8. Define Soldering, Brazing and Welding
1.9. List the materials used in soldering.
1.10. Explain the use of flux in soldering.
1.11. List three types of soldering joints for joining Electrical conductors.
1.12. List the soldering methods of PCBs

2.0 Familiarise with different types of Microphones and Loudspeakers.

2.1 List different types of Microphones based on impedance, polar characteristics and
2.2 Principle of working.
2.3 Explain the working of Carbon, Condenser and Crystal Microphones.
2.4 Compare the parameters like sensitivity, noise, frequency response, directivity,output
2.5 Impedance, bias necessity, size, cost and applications of above Microphones.
2.6 List the ratings of condenser, crystal, carbon, ribbon and dynamic Microphones.
2.7 Explain the constructional features and principle of operation of PMMC Loudspeaker and its ratings.

2.8 Mention the necessity of Baffle for Loudspeaker and types of Buffles (like open, infiinite, bass reflex, acoustic labyrinth).
2.9 Mention the use of woofers and tweeters.
2.10 Give the need for a Horn loudspeaker with its construction and advantages.Mention different types of Horns.
2.11 Compare the performance characteristics of cone type and Horn type loud speakers.
2.12 Explain the principle, constructionand working of crystal headphones and their uses.
2.13 Mention the specifications of Loudspeaker and Microphone.

3.0 Understand the working of Semiconductor Diodes.

3.1. State the electrical properties of solid Semiconductor materials.
3.2. Sketch energy level diagrams for conductors, Semiconductors, Insulators.

3.3. Distinguish between Intrinsic and extrinsic Semiconductors.

3.4. Describe the formation of P type and N type materials and sketch the energy band diagrams.

3.5. Explain Majority and Minority carriers in P and N Type materials.

3.6. Distinguish between Drift and Diffusion current.

3.7. Explain the formation of PN junction diode.

3.8. Describe the working of PN junction Diode with various biasing voltages.

3.9. Explain the forward/Reverse Bias Voltage characteristics of diode.

3.10. Interpret the manufacturer specifications of a given diode from data sheet.

3.11. Describe the formation and working of Zener diode.

3.12. Explain the characteristics of Zener diode.

3.13. Distinguish between Zener breakdown and Avalanche breakdown.

4.0 Understand the working of Transistor

4.1 Know the formation of Transistor.

4.2 Draw the symbol of Transistor.

4.3 Explain the working of PNP and NPN Transistors.

4.4 Describe the working of Transistor as an amplifier (CB configuration).

4.5 Draw the different Transistor configurations.

4.6 Know cut off, saturation and active regions.

4.7 Sketch the input/output characteristics of CB,CC and CE configurations.

4.8 Define alpha, beta and gamma Factors.

4.9 Relate alpha, beta and gamma Factors.

4.10 Write collector current expression in CB,CC and CE modes of Transistors in terms of α, β, IB, IC andICBO ,ICEO .

4.11 Compare the performance characteristics of Transistors in CB,CE and CC configurations.

5.0 Understand the working of DC Power Supplies.

5.1. Explain the necessity of D.C. power supply for Electronic circuits

5.2. Describe the working of HW, FW and Bridge section circuits with wave forms.

5.3. Give the equations for RMS value, average DC value; ripple factor and efficiency for the above circuits.

5.4. Define Voltage Regulation.

5.5. Explain the need for a filter circuit in power supplies.

5.6. Explain the operation of a rectifier circuit using Capacitor filter

5.7. Give the reasons for connecting a Bleeder Resistor across capacitor

5.8. Draw the input/output waveform of Rectifier with RC Filter Circuit

5.9. Mention the factors effecting the output ripple in RC

5.10. Draw the circuit of CRC Filter

5.11. Explain the function of components and working of CRC Filter

5.12. Give the reasons for popularity of RC filter circuits

5.13. Explain the working of CLC filters Circuit

5.14. Draw the input and output waveforms

5.15. Mention the demerits of CLC filters

5.16. List the applications where CLC filters are used

5.17. State the need for a regulated power supply

5.18. List important specifications of Regulated power supply

5.19. Draw the circuit of a simple Zener regulated DC Power supply.

5.20. Explain the working of Zener regulated power supply

5.21. Determine the Resistance value and wattage of Series Resistor , zener diode for a given Input voltage ,load voltage and load current

Course Content :

1. Electronic Assembly- Important hand tools used in the Electronic work shop - Engineers Files - Files used in the workshop and their usage - Types of hammers – Types of Screw drivers and their uses - Use of Adhesives for joining - Soldering –brazing – welding- Use of flux in soldering - Materials used in soldering- soldering methods.

2. Switches, connectors and Relays:Switches- Classification and types -Ratings and applications. I.S.I symbols – Fuse Protection-Types of fuses-Metals used for fuses- Fuse ratings- Connectors - Types of Connectors-MCB- Electromagnetic relay- Symbol -Classification - Specifications – Constructional details of general-purpose electromagnetic relay- NC and NO contacts- Arcing during changeover-- Contact materials - Use of Solenoid- Fly back diode- Difference between Relay and Contactor.

3. Semiconductor diodes: Electrical properties of semiconductor materials-energy level diagrams of conductor, semiconductor and Insulator-Formation of P-Type and N-Type materials and their properties-Drift and diffusion current- Formation and behaviour of PN junction diode.-Forward and Reverse bias characteristics, Specifications. -Zener diode- Characteristics-zener breakdown and avalanche breakdown.

4. Transistors-Formation and properties of PNP and NPN Transistor-Transistor configurations-input and output characteristics-α,β and γ factors- Comparison of CB,CE,CC configurations-Transistor as an amplifier.

5. DC Power supplies-necessity of D.C. power supply - working of HW, FW and Bridge section circuits -- equations for RMS value, average DC value; ripple factor and efficiency - Voltage Regulation- need for a filter circuit in power supplies- operation of a rectifier circuit using Capacitor filter -reasons for connecting a Bleeder Resistor across capacitor- input/output waveform of Rectifier with RC Filter Circuit- factors effecting the output ripple in RC- circuit of CRC Filter- function of components and working of CRC Filter- reasons for popularity of RC filter circuits- working of CLC filters Circuit- input and output waveforms- demerits of CLC filters-applications where CLC filters are used- need for a regulated power supply - important specifications of Regulated power supply- circuit of a simple Zener regulated DC Power supply-working of Zener regulated power supply-Determination of the Resistance value and wattage of Series Resistor , zener diode for a given Input voltage ,load voltage and load current

RECOMMENDED BOOKS

1. Basic Electrical Engineering Volume 1 by PS Dhogal , TMH
2. Electronic devices and applications by B. Somanathan Nair, PHI.
3. Understanding Electronics Components by Filipovic D. Miomir. Mikroe online Edition

REFERENCE BOOKS

1. Electronic Devices and Circuits by David A.Bell Prentice hall
2. Hand book of components for Electronics by Charles A. Harper McGrahills
3. Printed circuit Boards Design &Technology by Walter C. Boshart TMH

ELECTRICAL TECHNOLOGY

Subject Title : Electrical Technology

Subject Code : EC-206

Periods/Week : 5

Periods/Semester : 75

TIME SCHEDULE

SI	Major Topics	No. of Periods	weightage of Marks	Short Answer Questions	Essay Questions
1	AC Circuits	25	30	4	2
2	Resonance in AC circuits	10	15	4	1
3	Polyphase Circuits	10	15	4	1
4	DC Machines	15	30	4	2
5	AC Machines	15	30	4	2
	Total	75	120	20	8

1.0 Working Of AC Circuits

1.1. Mention Four types of mathematical representation of vectors

1.2. Explain symbolic notation of vectors

1.3. Explain the significance of operator j

1.4. Define conjugate of a complex number

1.5. Explain Trigonometrically form of a Vector

1.6. Mention Exponential form of a vector (No derivation)

1.7. Explain polar form of a Vector representation

1.8. Draw the Vector diagram given a vector in rectangular form

1.9. Solve simple exercises to Convert the Form of Vector from Rectangular to Polar and vice versa

1.10. Solve simple exercises to Convert the Form of Vector from Polar to Exponential and vice versa

1.11. Solve simple exercises on addition and subtraction of Vectors given in rectangular form

1.12. Draw the vector diagrams for the above exercises

1.13. Mention the suitability of complex form for additions and subtractions

1.14. Solve simple exercises on Multiplication and division of Vectors given in rectangular form

1.15. Solve simple exercises on Multiplication and division of Vectors given in rectangular form by converting into Polar form

1.16. Mention the suitability of Polar form for multiplication and Division

1.17. Explain the effect of AC flowing through Pure Resistance , Inductance and Capacitance with vector diagrams.

1.18. Define the terms Inductive reactance, Impedance, admittance, conductance and Power Factor

1.19. Explain Active and Reactive components of AC current

1.20. Explain Active and Reactive and apparent power in AC circuit.

1.21. Explain the importance of power factor

1.22. Define **Q factor** of a coil.

1.23. Explain AC through Resistance and Inductance connected in series.

1.24. Solve simple problems on RL series circuits

1.25. Explain AC through Resistance and capacitance connected in series.

1.26. Solve simple problems on RC series circuits

1.27. Calculate the impedance, power, current, phase angle and power factor in RL,RC and RLC series circuits.

1.28. Solve simple exercises in Parallel RL, RC , RLC Circuits

2.0 Resonance in AC circuits

2.1. Explain resonance in RLC series circuit

2.2. Derive the formula for series resonance

2.3. State the conditions for series resonance

2.4. Draw the characteristic curves for series resonance.

2.5. Define bandwidth of a resonant circuit

2.6. Define lower cut off and upper cut off frequencies

2.7. Give formula for lower cut off and upper cut off frequencies

2.8. Solve simple problems on series Resonance.

2.9. Explain Parallel AC circuit containing RLC

2.10. List the 3 methods a) Vector or phasor method b) Admittance method c) Vector algebra method. for solving AC parallel circuits.

2.11. Solve problems using above 3 methods
2.12. Explain Resonance in parallel circuits
2.13. State the conditions required for parallel resonance
2.14. Derive Equation for resonant frequency.
2.15. Give graphical representation of parallel resonance.
2.16. Compare Series and parallel resonance
2.17. Solve problems on Resonance
2.18. Explain effect of Resistance on Bandwidth.

3.0 Comprehend the POLYPHASE CIRCUITS

3.1. Define a power plant
3.2. List the 4 types of power plants (Hydel , Thermal, Nuclear and Solar)
3.3. Explain the basic principle of operation of above power plants
3.4. Explain With a line sketch how power from a power plant reaches the consumer
3.5. Explain generation of 3 phase voltages.
3.6. List the merits of 3 phase system over single phase.
3.7. Write the emf equations for R, Y, B phases and draw the vector diagram.
3.8. Explain the concept of phase sequence.
3.9. Explain star Delta configurations with diagrams.
3.10. Give the relation between Line Voltages, Phase voltages and Line currents &Phase currents in Star configuration
3.11. Explain the formation of Neutral at the junction in Star connections Give the relation between Line Voltages, Phase voltages and Line currents &Phase currents in Delta configuration
3.12. Solve simple problems in 3 phase circuits

4.0Understand the working of DC Machines

4.1. State Faraday's laws of electro - magnetic induction
4.2. Explain dynamically and statically induced E.M.F
4.3. State Lenz's law
4.4. State and Explain Fleming's right hand rule
4.5. State and explain the Fleming's left hand rule

4.6. Explain the principle of DC Generators.

4.7. Explain the constructional features of DC generator with a sketch.

4.8. Explain the function of commutator and brushes

4.9. List the two types of windings used in DC generators and state their use.

4.10. Classify DC generators based on the type of excitation and field

4.11. winding connections

4.12. Write the emf equation of DC generator.

4.13. Explain the characteristics of DC shunt Generator

4.14. Explain the principle of DC Motor.

4.15. Explain the significance of back EMF

4.16. Derive voltage equation of DC motor and condition for maximum power.

4.17. Derive equation for armature torque of dc motor

4.18. Derive equation for speed of a) DC series motor b) DC shunt motor

4.19. Define speed regulation of DC motor

4.20. Explain torque-speed behaviour of DC motor

4.21. Explain DC motor characteristics a) DC series motor b)DC shunt motor

4.22. Compare DC series motor and DC shunt motor

4.23. Explain power stages in DC motor

4.24. Mention the Losses in a DC Motor

4.25. Explain speed control of DC motors and factors affecting the speed.

4.26. Explain speed control of DC shunt motor by armature, field control

4.27. and armature resistance control

4.28. Solve simple problems related to DC motors

4.29. Explain the need for starter.

4.30. Explain with a circuit the working of a 3 point starter

4.31. Give 4 important specifications of a motor

4.32. Explain the choice of particular motor for a given application.

5.0 Understand the working of AC Machines

5.1 Explain the working principle of Transformer.

5.2 Derive the emf equation of Transformer.

5.3 State the relationship between voltage ratio, current ratio and turns ratio.

5.4 List different types of Transformers.

5.5 List the specifications and applications of transformers.

5.6 Mention the losses in Transformers.

5.7 Explain the working principle of Autotransformer

5.8 Explain the principle of spark plug for automobile applications

5.9 Explain the use of Transformer for Extra High voltage generation in CROs and TV picture tubes

5.10 Classify ac motors based on the principle of operation type of current and structural features

5.11 Explain the principle of induction motors

5.12 Explain the production of rotating magnetic field

5.13 Explain the constructional features of squirrel cage motor

5.14 Define slip, synchronous speed of an induction motor and give the relation

5.15 Write the equation for the frequency of rotor current

5.16 Draw the torque speed characteristics and explain

5.17 Explain the principle of Alternator

5.18 Mention various parts of an alternator and explain

5.19 Give equation for induced emf in an alternator

5.20 Explain the principle of synchronous motor

5.21 Explain the effect of excitation

5.22 Give applications of synchronous motors

5.23 List important specifications of an ac motor and mention their significance

5.24 List the various applications and choice of particular ac motor for a given application

5.25 Explain the working principle capacitor start single phase induction motor.

5.26 Explain the principle of universal motor

5.27 Explain the working principle and constructional features of Servo motors

5.28 Explain the choice of selecting a motor for a particular application

5.29 List 3 applications for each of above.

Course Content:

1.0 Vector representation of Alternating quantities- addition and subtraction of alternating quantities-Resultant vector of several alternating quantities**-** Effect of AC flowing through Pure Resistance , Inductance and Capacitance - Inductive reactance, Impedance, admittance, conductance and Power Factor- Active and Reactive components of AC current-Explain Active

and Reactive and apparent power in AC circuit- Importance of power factor- **Q factor** of a coil- Power in an iron cored choking coil.- AC through Resistance and capacitance connected in series-Solve simple problems on RC series circuits-Calculate the impedance, power, current, phase angle and power factor in RL,RC and RLC series circuits.

2.0. AC CIRCUITS -Representation of AC Series – parallel AC circuits - Problems - Resonance in A.C. Circuits & Coupled circuits - Series and parallel resonance. Condition for resonance, resonance curves, effect of resistance on Q factor selectivity and bandwidth,

3.0.POLYPHASE CIRCUITS- Generation of polyphase voltages and currents. Advantages of 3-phase system, 1–phase system, 3– phase star and 3–phase delta circuits-solving simple problems

4.0.DC MACHINES-Construction of D.C generators, simple lap and wave winding E.M.F., equation, classification of D.C machines on the basis of excitation, write voltage equations, elementary study characteristics of series shunt and compound generators. Losses and efficiency, principles of D.C. motors back E.M.F., speed torque equations, characteristics of series,, shunt and compound motors, motor starters, speed control

5.0.AC MACHINES -Principle and construction of alternator, types of alternator, e.m.f. equation and frequency, Production of rotating magnetic fields, principle and construction of 3 – phase induction motors, slip ring and squirrel cage, DOL, Star / delta starters, applications, Single phase induction motors, split phase, Capacitor start single phase induction motor - universal motor- Servo motors - choice of selecting a motor-applications for each of above

Text Books :

1. Electrical Technology Part –II by B Theraja

ENGINEERING DRAWING- II

Subject Title : **Engineering Drawing- II**
Subject Code : EC–207
Periods/Week : **06**
Periods Per Year : **90**

TIME SCHEDULE

S.No	Major Topics	No. of Drawing plates	Periods	Weightage of Marks	Short Answer Questions	Essay type Questions
1	Auxiliary views	01	06	10	1	½
2	Orthographic Projection	03	33	25	1	2
3	Pictorial drawing	03	30	25	1	2
4	Development of surfaces	03	21	20	1	1½
Total		**10**	**90**	**80**	**04**	**06**

The Course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

Pre-Requisite: Clear visualization and sound pictorial intelligence

OBJECTIVES
Upon completion of the subject the student shall be able to

1.0 Understand the need of auxiliary views
- 1.1 State the need of Auxiliary views for a given engineering drawing.
- 1.2 Draw the auxiliary views of a given engineering component
- 1.3 Differentiate between auxiliary view and apparent view

Drawing plate No.1: (Having 4 exercises)

2.0 Apply principles of orthographic projection
- 2.1 Explain the principles of orthographic projection with simple sketches.
- 2.2 Draw the orthographic view of an object from its pictorial drawing.
- 2.3 Draw the minimum number of views needed to represent a given object fully.

Drawing Plate No. 2 : (Having 8 to 10 exercises)
Drawing Plate No. 3 : (Having 8 to 10 exercises)
Drawing Plate No. 4 : (Having 8 to 10 exercises)

3.0 Prepare pictorial drawings
- 3.1 State the need of pictorial drawings.
- 3.2 Differentiate between isometric scale and true scale.
- 3.3 Prepare Isometric views for the given orthographic drawings.

Drawing plate No 5: (Having 10 to 12 exercises)
Drawing plate No. 6: (Having 10 to 12 exercises)
Drawing plate No. 7: (Having 10 to 12 exercises)

4.0 Interpret Development of surfaces of different solids

11.1 State the need for preparing development drawing.

11.2 Prepare development of simple engineering objects (cubes, prisms, cylinders, cones, pyramid) using parallel line and radial line method.

11.3 Prepare development of surface of engineering components like trays, funnel, 90^0 elbow & rectangular duct.

Drawing plate No. 8: (Having 05 exercises)
Drawing plate No. 9: (Having 05 exercises)
Drawing plate No. 10: (Having 05 exercises)

Competencies and Key competencies to be achieved by the student

S.No	Major topic	Key Competency
1.	Auxiliary views	• Draw the auxiliary views of a given Engineering component • Differentiate between Auxiliary view and apparent view
2.	Orthographic Projection	• Draw the minimum number of views needed to represent a given object fully.
3.	Pictorial drawing	• Differentiate between isometric scale and true scale. • Draw the isometric views of given objects,.
4.	Development of surfaces	• Prepare development of Surface of Engineering components like trays, funnel, 90^0 elbow & rectangular duct.

COURSE CONTENT

NOTE

1. **B.I.S Specification should invariably be followed in all the topics.**
2. **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

1.0 Auxiliary views

Need for drawing auxiliary views -Explanation of the basic principles of drawing an auxiliary views explanation of reference plane and auxiliary plane - Partial auxiliary view.

2.0 Orthographic Projections

Meaning of orthographic projection -Using a viewing box and a model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object -Concept of front view, top view, and side view sketching these views for a number of engg objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines -Selection of minimum number of views to describe an object fully.

3.0 Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective and their use - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale difference between Isometric view and Isometric projection - Isometric and non-Isometric lines -Isometric drawing of common features like rectangles, circular - shapes, non-isometric lines - Use of box and offset methods

4.0 Development of Surfaces

Need for preparing development of surface with reference to sheet metal work -Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal and parallel to the other -Development of simple solids like cubes, prisms, cylinders, cones, pyramid (sketches only) -Types of development: Parallel line and radial line development -Procedure of drawing development, drawings of trays, funnels, 90^0 elbow pipes and rectangular ducts.

REFERENCE BOOKS

Engineering Graphics by P I Varghese – (McGraw-hill)
Engineering Drawing by Basant Agarwal & C.M Agarwal - (McGraw-hill)
Engineering Drawing by N.D.Bhatt.
T.S.M. & S.S.M on " Technical Drawing" prepared by T.T.T.I., Madras.
SP-46-1998 – Bureau of Indian Standards.

BASIC ELECTRONICS LABORATORY PRACTICE

Subject title : Basic Electronic Laboratory Practice
Subject code : EC-208
Periods per week : 4
Periods / Semester : 60

TIME SCHEDULE

Sl NO	Major Topics	Periods
1	Using Analog & Digital Multimeter	8
2	Using CRO & Function Generator	12
3	Electronic components	20
4	Soldering practice & Preparation of PCB	12
5	Connecting Equipment	8
	Total Periods	60

Note: a) Each student should complete a minimum of 20 Experiments
b) Experiments in unit one not to be given in the end Examination
c) For Exercise outcomes refer to the Competencies table given below

I. Using Analog and Digital Multimeters

1. Identify electronic equipment and draw their circuit Symbols
2. To use Analog and Digital Multimeters
   a) Identify the Range selector and Terminals (Both Digital and analog)
   b) Connect batteries in series and parallel and observe the output voltage using DMM
   c) Keep the multimeter in mA mode and Measure the current through a given Resistor

II. Using CRO & Function generator

3. Identify the front panel controls an practice setting them in correct positions to get trace on the CRO
   A. Identify different controls on Function generator

B. Set the function generator frequency to 1 kHz (sine wave mode) and measure AC output voltage using DMM

4. Observe the output of function generator (AC waveform) on CRO and set function generator to a) 10 mV b) 1V c) 6 V
   A. Observe different waveforms produced by function generator
   B. Measure the frequency and Amplitude of the signal on CRO
5. Connect the output of function generator to a speaker with 100 mFd capacitor in series and observe the effect of variation in frequency and wave form
   A. Connect a 1.5 V cell to a speaker with 100 mFd capacitor in series and observe the effect

III. Electronic components

6. Identify and work with Resistors
7. Measure DC Voltage and DC current using Voltmeter , ammeter &Multimeter
8. Verify Ohms Law and kirchoff's laws
9. Measure Resistance using Voltmeter and DRB
10. A) Verify the laws of Resistance using a nichrome wire and Multimeter
    B) Verify the effect of temperature on Resistance Using electric lamp , Multimeter, Voltmeter and Ammeter
11. A.) Verify voltage and current relationship in series and parallel resistive circuits.
    B) Connect Resistors in series and parallel combination to get the required value and Verify with DMM
12. Observe the variation of Resistance of LDR with DMM by varying incident light
13. Observe the variation of Resistance of thermistor by heating the thermistor with soldering Iron
14. To observe the Functioning of transformer
15. Identify and find the value of different types of capacitors
16. Verify the behaviour of capacitor
17. Determine the component type (Black box testing)using multimeter and power supply
18. Identify different switches &their terminals
19. Test the given relay and identify NO and NC Contacts
20. Identify the Bimetallic strip (used in Iron box) and observe its construction

IV. Soldering practice & Preparation of PCB

21. Practice Soldering
22. Practice Desoldering using Desoldering Wick and Desoldering Pump
23. Identify and fix/Solder different types of connectors

V. Connecting Electronic Equipment

24. A. Connect Public Address system and test
    A. Tuning TV to desired station
    B. Connect audio video equipment (DVD Player) to TV and LCD projector
    C. Connect the computer hardware (keyboard, mouse etc)

Competencies &Key Competencies to be achieved

Sl no	Exercise	➢ Competency	▪ Key Competency
1	To Identify electronic equipment and draw their circuit Symbols(4) . Identification of meters and equipment 1. DMM 2. Analog Multimetr 3.DC Voltmeters/Ammeters 4. DC Power supply 5. DRB 6. DCB 7. DIB 8. CRO 9. Function Generator etc	➢ Draw the symbols used in Electronic Circuits ➢ Identify the meters and equipment ➢ Use DRB, DIB and DCB ➢ Set the required voltage On power supply	▪ Identify and draw the symbols used in Electronic Circuits ▪ Identify the meters and equipment ▪ Use DRB, DIB and DCB ▪ Set the required voltage On power supply
2	To Work with Multimeter (Both Digital and analog) (3) a)To Measure resistance of a wire/Component using multimeter b) To check continuity with	➢ Identify analog and Digital multimeters ➢ Zero adjusting analog multimeter ➢ Select the correct Range ➢ Measuring Voltage , Current and Resistance	▪ Use the Multimeter to measure Voltage, current , Resistance by choosing correct range and mode.

	multimeter c)To Measure Battery Voltage using Voltmeter and Multimeter	with Multimeter	
3	To Connect batteries in series and parallel and observe the output voltage using DMM (3)	➢ Measure DC voltage with DMM ➢ Test the cells ➢ practice Series and Parallel connection of Cells ➢ Observe the polarity ➢ observe the effect on Terminal Voltage	▪ Make series and parallel connection of batteries ▪ Use DMM to measure Voltage
4	To use the CRO and Function Generator to observe the signal and measure Voltage Time period and frequency (3) A. Identify the front panel controls an practice setting them in correct positions to get trace on the CRO B. Identify different controls on Function generator Connect the output of function generator to a speaker with 100 mFd capacitor in series and observe the effect of variation in frequency and wave form C. Connect a 1.5 V cell to	➢ Identifying front panel controls ➢ Setting the Brightness , Focus to correct levels ➢ Adjust the X/Y controls ➢ Adjust time base to match input signal frequency ➢ Adjust Volts/ Div to match input signal amplitude ➢ Connect BNC connector and apply signal ➢ Adjust the trace to center position using ground mode ➢ Test the speaker	▪ Observe the input signal on CRO

	a speaker with 100 mFd capacitor in series and observe the effect D. Connect the speaker to CRO and observe your voice signal on CRO		
5	Set the function generator frequency to 1 kHz (sine wave mode) and measure AC output voltage using DMM A. Observe the output of function generator (AC waveform) on CRO and set function generator to a) 10 mV b) 1V c) 6 V A. Observe different waveforms produced by function generator B. Measure the frequency and Amplitude of the signal on CRO	➢ Connect function generator to CRO with BNC connector ➢ Adjust front panel controls ➢ Measure the voltage ➢ Measure Time period ➢ Measure frequency	▪ Measure the AC/DC signal Voltage using CRO ▪ Measure the voltage ▪ Measure Time period ▪ Measure frequency
6	To identify & Work with Resistors (3) a) To Identify different types of resistors i) CFR ii) MFR iii)Resistor packs iv) Wire wound Resistors,v) Presets b) To determine Resistance from colour code	➢ Identify different types of resistors ➢ Find the value of Resistance from colour code of CFR and MFR types ➢ Use resistor combination to get desired resistance	▪ Identify resistance type by observation ▪ Findthe value of Resistance from colour code of CFR ang MFR types

	c) To Connect resistors in series and parallel and measuring the resistance using multimeter d) To make Rheostat connections	➢ Identify the terminals on Rheostat ➢ Set the Rheostat to Minimum and maximum positions ➢ Observe Resistance change using DMM	▪ Set the Rheostat to Minimum and maximum positions
7	To Measure DC Voltage and DC current (3) b) To measure Voltage &current using Multimeter	➢ Connect Voltmeter and Ammeter to measure DC Voltage and Current using Voltmeter and Ammeter ➢ Measure Voltage &Current using Multimeter	▪ measure DC Voltage and Current using Voltmeter and Ammeter
8	To Verify Ohms Law and Kirchoffs laws(3)	➢ verify ohms law& Kirchoff's laws and establish relation between Voltage current and Resistance	▪ Practically verify the relation between Voltage current and Resistance
9	To Measure Resistance using Voltmeter and DRB (1 ½)	➢ Use the DRB ➢ Apply Ohms law in practical situations	▪ Measure the Resistance using Voltmeter and DRB
10	To Verify the laws of Resistance using a nichrome wire and Multimeter(1 ½)	➢ verify the laws of Resistance experimentally ➢ Measure resistance using Multimeter	▪ Use the multimeter to measure Resistance
11	To Verify the effect of temperature on Resistance Using electric lamp ,Multimeter, Voltmeter and Ammeter (3)	➢ Measure Resistance using multimeter by selecting correct range ➢ Observe the difference between Cold Resistance and Hot Resistance	▪ Measure Voltage current and resistance
12	To Verify voltage and	➢ Observe branch	▪ Measure currents

	current relationship in series and parallel resistive circuits(3)	currents in series Parallel circuits ➢ Verifying current division in parallel circuits with calculated values	and Voltages and draw inferences
13	A. Observe the variation of Resistance of LDR with DMM by varying incident light B. Observe the variation of Resistance of Thermistor with DMM by heating Thermistor with soldering iron 1.	➢ Identify the LDR ➢ Measure Dark resistance ➢ Expose the LDR to controlled light ➢ Measure Resistance with DMM ➢ Identify thermistor ➢ Heat the thermistor without damaging ➢ Observe the effects	▪ Measure the Resistance ▪ Observe behaviour of the devices
14	To observe the functioning of transformer (4) a)Identify the transformer type based on tappings i. Center tapped ii. Multi tapped iii. Normal b) To test the given transformer using a multimeter identify the windings c) To find the Transformation ratio d) To Verify step up or step down action of transformer	➢ Identify the transformer type based on tappings ➢ i. Center tapped ii. Multi tapped iii. Normal ➢ Test the given transformer using a multimeter identify the windings ➢ Find the Transformation ratio ➢ Verify step up or step down action of transformer	▪ Identify the type of transformer ▪ Test the transformer with multimeter
15	To Identify and find the value of different types of capacitors (2)	➢ Identify different types of capacitors by their name ➢ Read the specifications	▪ Identify capacitor type ▪ Read the value of

	a) Find the value/specifications of capacitor from Value printed ,and from Color code	and Ratings ➢ Find the value of capacitor from the color code	capacitor ▪ Test the capacitor
16	To verify the behavior of capacitor (3) a) To verify charging and discharging using an LED a) Investigate the effect of connecting capacitors in series and parallel b) To Test the capacitor Using multimeter, AC source (Transformer / Function generator) and headphones	➢ Verify the behavior of capacitor by experimentation ➢ Connect Capacitors in series and parallel and observing the effect on total capacitance ➢ Test the capacitor using multimeter and other methods	▪ Verify the behavior of capacitors ▪ Connect capacitors in series parallel combination to get desired value ▪ Test the capacitors
17	To determine the component type (Black box testing)using multimeter and power supply(1 ½) a) identify the given component concealed in a box with two terminals available for testing using multimeter and power supply	➢ Identify a given component by testing with DMM and power supply	▪ Identify a given component by testing with DMM and power supply
18	To Identify different switches &their terminals (3) a) Identify different types of switches and their symbols b) To use Toggle switches Rotary switches, Push	➢ Identify different types of switches by observation , By name and symbol ➢ Use DPDT switch to reverse the Direction Tape recorder motor ➢ Observe the	▪ Identify the type of switch and its name ▪ Use DPDT switch ▪ Test switches using DMM

	button switches, DIP switches b)To Control a small Tape -recorder motor with a DPDT switch to run in forward and Reverse Directions.	constructional details and ratings of tape recorder motor	
19	To Test the given relay and identify NO and NC Contacts(3) b) To Use the relay to control a lamp load c) To Use the double pole relay to control a fan motor d) To Make a simple relay motor control using double pole relay and push button switches	➢ Observe the constructional details of Relay ➢ Test /identify the coil connections with Multimeter ➢ Use the relay in practical circuits	▪ Make relay connections ▪ Test and use the relay
20	To Identify the Bimetallic strip (used in Iron box) and observe its construction(3) a)To Open the tube light starter and observe its construction. b) To Connect a tubelight starter in series with an incandescent lamp and observe the operation of bimetallic strip 1.	➢ Identification of Bimetallic Strip ➢ Verify the behavior of Bimetallic strip ➢ Observe the constructional details of tube light starter ➢ Use bimetallic strip in practical circuits	▪ Identify Bimetallic strips ▪ Use the Bimetallic strips in practical applications.
21	To Practice Soldering (9) by I.Making wire tips II.joining wires	➢ Check whether a metal is solderable ➢ Check solder specifications	▪ Practice soldering ▪ Populate PCBs ▪ Test the PCB tracks with DMM

	III.joining components IV.populating simple circuits like, Audio amplifier) on a breadboard b)To test the soldered connections using multimeter	➢ use the Flux in soldering Practice the soldering ➢ check the soldered joint by physical observation and Multimeter	
22	To Practice Desoldering using Desoldering Wick and Desoldering Pump(4)	➢ Desolder using ➢ a) Desoldering Wick ➢ b)Desoldering Pump	▪ Desolder using Wick and Pump
23	To Identify and fix different types of connectors Identify(3) a) power connectors b) Molex connectors c)Edge connectors d)Terminal blocks e) Wire to Board, Board to Board , Flat cable connectors Keyed connectors for microphone Male and Female types f) Lugs , Blade connectors, Ring and spade terminals etc	➢ Identify different types of connectors used in electronic circuits by their name ➢ Select the right connector and terminal blocks based on the requirements	▪ Identify different types of connectors used in electronic circuits by their name and use them in the circuits ▪ Select the right connector ▪ Fix the wire terminals. ▪ Connect lugs by crimping and soldering
24	To connect Public Address system and test(3)	➢ Make amplifier and speaker connections ➢ Observe Impedance matching ➢ Use the various front panel and back panel controls	▪ Connect the amplifier , microphone and speakers
25	A. To Connect audio video	➢ Identify user controls on	▪ Set up the

	equipment(DVD Player) and TV/ LCD projector B. To Tune TV to desired station C. To Connect the computer hardware (keyboard, mouse etc) (3) a) connect computer to LCD projector	the equipment ➢ Set up the LCD projector using menu control/ Remote control ➢ Identify audio video sockets on LCD projector /TV monitor/DVD player ➢ Connect audio video cable to the Monitor/ Projector to the DVD / Settop box and testing	projector using menu control/ Remote control ▪ Tune the TV receiver/ set top box
		➢ Connect the basic computer Hardware CPU , Keyboard , Mouse etc ➢ Identify the ports on CPU ➢ Connect Speakers to the computer) ➢ Identify Computer Power switch and various ports on CPU ➢ Identify various computer cables ➢ Connect mouse & keyboard ➢ Connect headphones /speakers/ Microphone ➢ Connect the monitor/ LCD Projector using VGA /HDMI cable	▪ Connect external hardware to the CPU ▪ Set up LCD projector ▪ Connect PC/Laptop to Projector

PHYSICS LAB – II

(Common for all branches)

Subject Title	**:**	**Physics Lab - II**
Subject Code	**:**	**EC-209**
Periods per week	**:**	**03**
Total periods per semester	**:**	**23**

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Focal length and Focal power of convex lens (Separate & Combination)	03
2.	Simple pendulum	03
3.	Velocity of sound in air – (Resonance method)	03
4.	Surface tension of liquid using traveling microscope	03
5.	Coefficient of Viscosity by capillary method	03
6.	Mapping of magnet lines of force	03
	Revision	03
	Test	02
	Total:	**23**

Objectives:

Upon completion of the course the student shall be able to

1.0 Determine the Focal length and focal power of convex lenses using U-V and graphical method

2.0 Determine the value of acceleration due to gravity using Simple Pendulum and verify with $L\text{-}T^2$ graph.

3.0 Determine the velocity of sound in air at room temperature

4.0 Determine the surface tension of a liquid using travelling microscope

5.0 Determine the viscosity of a liquid using capillary method

6.0 Practice the mapping of magnetic lines of force

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	**Competencies**	**Key competencies**
1. Focal length and Focal power of convex lens (Separate & Combination) (03)	• Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex	• Calculate the focal length and power of convex lens • Draw u-v and 1/u – 1/v graph
2. Simple pendulum(03)	• Fix the simple pendulum to the stand • Adjust the length of pendulum • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and l-T^2 graph	• Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and l-T^2 graph
3. Velocity of sound in air –Resonance method (03)	• Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonanting lengths • Calculate velocity of sound	• Adjust the reservoir level • Find the first and second resonanting lengths • Calculate velocity of sound • Calculate velocity of sound at 0^0 C
4. Surface tension of liquid using traveling microscope(03)	• Find the least count of vernier on microscope • Focus the microscope to the lower meniscus & bent pin • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water	• Read the scale • Calculate height of liquid rise • Calculate the surface tension of water

5. Coefficient of viscosity by capillary method(03)	• Find the least count of vernier • Fix the capillary tube to aspiratory bottle • Find the mass of collected water • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water using capillary method	• Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water
6. Mapping of magnet lines of force(03)	• Draw magnetic meridian • Placed the bar magnet in NN and NS directions • Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines	• Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines

PREPARED BY BIFURCATION COMMITTEE

1. Dr M.E. JAYARAJ, HGS, GPW(M) BADANGPET, R.R. DIST
2. Dr V.V.M. JAGANNADHA RAO, HGS, GPT, NARAYANKHED, SANGAREDDY DIST
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CHEMISTRY LAB – SEMESTER -II

(Common for all branches)

Subject Title : Chemistry Lab - II

Subject Code : EC-210

Periods per week : 03

Total periods per semester : 23

TIMESCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Determination of acidity of water sample	03
2.	Determination of alkalinity of water sample	03
3.	Determination of total hardness of water using Std. EDTA solution	03
4.	Estimation of Chlorides present in water sample	03
5.	Estimation of Dissolved Oxygen (D.O) in water sample	03
6.	Determination of pH using pH meter	03
	Revision	03
	Test	02
	Total:	**23**

PREPARED BY BIFURCATION COMMITTEE

1. Dr . V. RAJANARENDER REDDY , HGS, GIOE, SECUNDERABAD
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*C**OMPUTER FUNDAMENTALS LAB -2***

(Common to All Braches other than CME & IT)

Subject Title : Compute Fundamentals Lab-2
Subject Code : EC-211
Periods/Week : 3
Periods/Semester : 45

LIST OF EXPERIMENTS

1.0 MS-WORD

1.1. Open MS-word and Identify the components on the screen
1.2. Create a document using MS-word and save it.
1.3. Create a table using MS-Word and save it.
1.4. Apply formulas in table & sort the table
1.5. Convert text into table & table into text.
1.6. Insertion of new rows and columns in the existing table and changing background colour in Table
1.7. Merging and splitting of cells in a Table
1.8. Changing the formatting of font
1.9. Exercise with Headers and Footers, paragraph tool bar
1.10. Insert objects into the document like pictures, shapes, charts, word-art.
1.11. Create mailing letters using mail merge tool of MS-word
1.12. Printing a document , page setting, different views of a document
1.13. Import & export files to & from Word.

2.0 MS-EXCEL

2.1. Open MS-Excel and identify the components on the screen
2.2. Create a Worksheet in MS-Excel and save it in .xls or .xlsx format
2.3. Inserting column and row in Excel
2.4. Creation of new worksheet in the existing Excel Book file
2.5. Generate a Chart using the data in Excel-worksheet
2.6. Automate calculations in a worksheet using formula
2.7. Sort and filter data in a worksheet

2.8. Protecting a worksheet, working with multiple sheets

3.0 MS-POWERPOINT

3.1. Create a simple Power point presentation for a small topic and saving in .ppt or pptx format

3.2. Inserting a new slide in the existing PowerPoint file

3.3. Inserting chart or image in a PowerPoint slide

3.4. Exercise with animation and sound features in PowerPoint

3.5. Exercise with Rehearse Timings feature in PowerPoint

3.6. Exercise in printing the PowerPoint file in (a) Slides (b) Handouts

OBJECTIVES AND KEY COMPETENCIES

S. No	Name of Experiment	Objectives	Key Competencies
1.	Open MS-Word from (i) Programs (ii) Run and Identify the components on the screen	✚ Able to Open MS-word and Identify the components on the screen	❖ Check whether able to Identify the components on the screen ❖ Check whether able to Identify all components on the screen of MSWORD are identified and learnt thoroughly
2.	Insertion of new rows and columns in the existing table and changing the background colour of the table	✚ Able to Insert new rows and columns in the existing table ✚ Able to Change the background colour of the table	❖ Check whether able to Insert new rows and columns in the existing table ❖ Check whether able to Insert new rows and columns as per requirement ❖ Check whether able to Change the background colour of the table
3.	Merging and splitting of cells in a Table	✚ Able to Merge and split cells in a Table using right click method	❖ Check whether able to Merge and split cells in a Table using right click method
4.	Changing the formatting of font	✚ Able to Change the formatting of font using right click menu ✚ Able to Change the formatting of font using menu options	❖ Check whether able to Change the formatting of font using right click menu ❖ Check whether able to Change the formatting of font using menu options
5.	Exercise with Headers and	✚ Able to change Headers and Footers using menu option	❖ Check whether Able to change Headers and Footers using menu

	Footers	➢ Able to change Headers and Footers by clicking top and bottom document	option ❖ Check whether able to change Headers and Footers by clicking top and bottom document
6.	Create mailing letters using mail merge tool of MS-word	➢ Able to use mail merge tool of MS-word using start mail merge option in mail menu	❖ Check whether Able to use mail merge tool of MS-word in creating letter using mail merge option in mail menu
7.	Open MS-Excel and identify the components on the screen	➢ Able to Open MS-Excel and identify the components on the screen	❖ Check whether Able to Open MS-Excel and identify the components on the screen ❖ Check whether all components are known on screen
8.	Create a Worksheet in MS-Excel and save it in .xls or .xlsx format	➢ Able to Create a Worksheet in MS-Excel ➢ Able to save it in .xls or .xlsx format	❖ Check whether Able to Create a Worksheet in MS-Excel ❖ Check whether Able to save it in .xls or .xlsx format
9.	Inserting column and row in Excel	➢ Able to Insert column and row in Excel using menu options ➢ Able to Insert column and row in Excel by right clicking rows or columns appropriately	❖ Check whether able to Insert column and row in Excel using menu option ❖ Check proper addition rows and columns in given sheet ❖ Check whether able to Insert column and row in Excel by right clicking rows or columns appropriately
10.	Creation of new worksheet in the existing Excel Book file	➢ Able to create worksheet in the existing Excel Book file by using Insert worksheet option besides existing sheets	❖ Verify whether able to create worksheet in the existing Excel Book file by using Insert worksheet option
11.	Generate a Chart using the data in Excel-worksheet	➢ Able to Generate a Chart using the data in Excel-worksheet	❖ Check whether able to Generate a Chart using the data in Excel-worksheet ❖ Verify whether chart prepared is as per the data given
12.	Automate calculations in a worksheet using	➢ Able to Automate calculations in a worksheet using fx formula ➢ Able to use sigma function	❖ Check whether Able to Automate calculations in a worksheet using fx formula

	formula	➢ Able to use function library option in formula menu	❖ Verify whether Able to use sigma function ❖ Check whether Able to use function library option in formula menu
13.	Sort and filter data in a worksheet	➢ Able to Sort data in a worksheet using sort option in Data menu ➢ Able to Sort data in a worksheet using sort option in right click ➢ Able to filter data in a worksheet in data menu ➢ Able to filter data in a worksheet in right click	❖ Verify whether Able to Sort data in a worksheet using sort option in Data menu ❖ Verify whether Able to Sort data in a worksheet using sort option in right click ❖ Check whether Able to filter data in a worksheet in data menu ❖ Check whether Able to filter data in a worksheet in right click
14.	Inserting a new slide in the existing powerpoint file	➢ Able to Insert a new slide in the existing powerpoint file using newslide option in home menu ➢ Able to Insert a new slide in the existing powerpoint file using slide layout option in home menu	❖ Check whether Able to Insert a new slide in the existing powerpoint file using newslide option in home menu ❖ Check whether Able to Insert a new slide in the existing powerpoint file using slide layout option in home menu
15.	Create a simple Power point presentation for a small topic and saving in .ppt or pptx format	➢ Able to create a simple Power point presentation for a given topic ➢ Able to Save the presentation in both .ppt or pptx format	❖ Check Able to create a simple Power point presentation for a given topic ❖ Check Able to Save the presentation in both .ppt or pptx format
16.	Inserting chart or image in a powerpoint slide	➢ Able to Insert chart in a power point slide using Insert menu option ➢ Able to Insert image in a power point slide using insert menu option	❖ Check Able to Insert chart in a power point slide ❖ Check Able to Insert image in a power point slide
17.	Exercise with animation and sound features in powerpoint	➢ Able to work with animation and sound features in power point using custom animation option in Animations menu ➢ Able to work with Media clip options in insert menu	❖ Check Able to work with animation and sound features in power point using custom animation option in Animations menu ❖ Check Able to work with Media clip options in insert menu
18.	Exercise with Rehearse Timings feature in powerpoint	➢ Able to work with Rehearse Timings feature in powerpoint using slide show menu rehearse option	❖ Check able to work with rehearse timings features

19.	Exercise in printing the powerpoint file in (a) Slides (b) Handout	➢ Able to print the powerpoint file in Slides using File menu Print option ➢ Able to print the powerpoint file in ➢ Handout using file menu print option	❖ Check to print the powerpoint file in Slides using File menu Print option ❖ Check to print the powerpoint file in Handout using file menu print option

III SEMESTER

DIPLOMA IN ELECTRONICS &COMMUNICATION ENGINEERING

C-16 SCHEME OF INSTITUTIONS AND EXAMINATIONS

III SEMESTER

Subject Code	Name of the subject	Institution periods/week		Total periods/year	Scheme of Examination			
			Practical		Duration(Hours)	Sessional marks	End exam marks	Total marks
THEORY SUBJECTS								
EC-301	Engineering mathematics-III	4		60	3	20	80	100
EC-302	Electronic Devices & Circuits	5		75	3	20	80	100
EC-303	Network Analysis	5		75	3	20	80	100
EC-304	Analog Communication systems	5		75	3	20	80	100
EC-305	Digital Electronics	4		60	3	20	80	100
EC-306	Electronic Measuring Instruments	5		75	3	20	80	100
PRACTICAL SUBJECTS								
EC-307	Electronic Devices & Circuits Lab Practice		3	45	3	40	60	100
EC-308	Communication skills and Life skills lab Practice		4	60	3	40	60	100
EC-309	Digital Electronics & ECAD Tools Lab Practice		4	60	3	40	60	100
EC-310	Analog Communication lab Practice		3	45	3	40	60	100
	Total	28	14	630		280	720	1000

ENGINEERING MATHEMATICS – III

Subject Title : Engineering Mathematics-III (Common for all branches)

Subject Code : EC-301

Periods per week : 04

Periods per Semester : 60

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	2 1/2	3
			Marks:	15	12	3	25	25	30

R: Remembering type 40 marks

U: Understading type 37 marks

App: Application type 33 marks

Objectives : **Upon completion of the course the student should 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 $\int u.v dx$.

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.

iv. 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 CONTENT

Unit-I

Indefinite Integration:

1**.** Integration regarded as anti-derivative – Indefinite integral of standard functions. Properties 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
3. Statistical Methods Vol.I, Das, Tata McGraw-Hill
4. Statistics, 4/e, Schaum's Outline Series (SIE), McGraw-Hill

ELECTRONIC DEVICES & CIRCUITS

Subject title : **Electronic Devices & Circuits**

Subject code : EC-302

Periods/week : 05

Periods/semester : 75

Rationale: Electronic devices and circuits is a core subject. Since semiconductor devices and circuits form the basis of Electronics & Communication Engineering, knowledge of semiconductor devices and their applications is very much essential for an Electronics and communication engineering student not only from the industry point of view but also from knowledge perspective. Stress is laid on study of the behavior of various devices and circuits including practical applications. This course serves as a foundation for other advanced courses.

TIME SCHEDULE

Sl	Major Topics	Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1	FETs and MOSFETs	12	16	2	1
2	Small signal amplifiers	12	16	2	1
3	Multi-stage & Feedback amplifiers	15	26	2	2
4	Power & Tuned amplifiers	15	26	2	2
5	Oscillators	9	13	1	1
6	Special semiconductor devices	12	13	1	1
	TOTAL	75	110	10	8

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

1.0. Understand the working of FETs AND MOSFETs.

1.1. Compare JFET and BJT

1.2. List the merits of JFET over BJT.

1.3. Explain the principle of operation of n-channel JFET with a sketch

1.4. Draw and explain the drain characteristics of JFET.

1.5. Define pinch-off voltage of JFET.

1.6. Draw and explain the mutual characteristics of JFET.

1.7. Define important parameters of JFET and obtain the relation among them.

1.8. List the important specifications of JFET

1.9. List the important applications of JFET

1.10. Explain the use of JFET as current source with a circuit diagram

1.11. Classify the different types of JFETs

1.12. Explain the construction and principle of operation of depletion type n-channel MOSFET.

1.13. Explain the construction and principle of operation of enhancement type n-channel MOSFET.

1.14. Compare JFET and MOSFET.

1.15. Explain the principle of operation of CMOSFET.

2.0 **Understand the working of small signal amplifiers.**

2.1. Explain the basic amplifier concept using BJT-CE mode.

2.2. Explain the reason for wide use of CE amplifier.

2.3. Explain the concept of DC and AC load line.

2.4. Explain the selection of operating point on DC load line with waveforms.

2.5. List the factors affecting the Q-point.

2.6. Explain thermal runaway

2.7. State the need for proper biasing in amplifier circuits.

2.8. List the types of biasing circuits.

2.9. Define stabilization in amplifier circuits.

2.10. Define the various stability factors (S, S_β, S_{VBE})

2.11. Derive an expression for stability factor in CE configuration.

2.12. Explain the fixed bias circuit and derive its stability factor.

2.13. Explain the collector to base resistor method of biasing and derive its stability factor.

2.14. Explain the self bias circuit and derive its stability factor.

2.15. Draw the circuit of single stage RC Coupled CE amplifier.

2.16. Mention the merits of Resistor -Capacitor coupling

2.17. Mention the names of components such as biasing Resistors, Coupling capacitor ,Emitter Bypass capacitor , Emitter Resistor and Load Resistor of CE Amplifier

2.18. State the purpose of each component in RC coupled CE amplifier circuit

2.19. Define gain, frequency response and bandwidth of an amplifier.

2.20. Mention the reasons for fall in gain at both low and high frequencies in RC coupled amplifier

2.21. Define h-parameters of a transistor.

2.22. Draw the circuit of common source FET amplifier and explain its operation.

3.0 Understand the working of Feedback and Power amplifiers.

3.1. Draw the basic block diagram of a feedback amplifier and explain.

3.2. Derive the expression for gain in a feedback amplifier.

3.3. Explain negative and positive feedback.

3.4. Draw the block diagrams of voltage series feedback amplifier.

3.5. Draw the block diagrams of voltage shunt feedback amplifier

3.6. Draw the block diagrams of current series feedback amplifier

3.7. Draw the block diagrams of current series feedback amplifier

3.8. State the effect of negative feedback on gain, bandwidth, input and output

3.9. impedances.

3.10. List the advantages of negative feedback amplifiers.

3.11. Compare characteristics of above feedback amplifiers

3.12. Explain Voltage series feedback using Emitter follower amplifier circuit

4.0. **Understand the working of Power Amplifier Circuits**

4.1. Classify amplifiers based on coupling, feedback , frequency and Power.

4.2. State the need for multi-stage amplifiers.
4.3. State the need for a power amplifier.
4.4. Distinguish between voltage and power amplifiers.
4.5. Draw the block diagram showing various stages of power amplifier
4.6. List three performance measures of power amplifier
4.7. Classify power amplifiers based on conduction (Class A, B, AB & C)
4.8. Draw the input and output waveforms of Class A, Class B, Class AB & Class C amplifiers
4.9. Compare Efficiency of different types of amplifiers(A,B,AB & C)
4.10. Draw the circuit of class A amplifier with resistor load and explain its operation.
4.11. Derive the expression for efficiency of the above circuit.
4.12. Draw the circuit of class A amplifier with transformer load and explain its operation.

4.13. Derive the expression for efficiency of the above circuit.
4.14. Draw and explain the operation of class-B push-pull amplifier.
4.15. Derive the expression for efficiency of class-B push-pull amplifier.
4.16. Write the advantages & disadvantages of push-pull amplifier.
4.17. Draw the circuit of complementary symmetry push-pull amplifier and explain its operation.

4.18. Explain the effect of distortion in amplifiers
4.19. List six distortions in power amplifiers
4.20. Explain Amplitude distortion and Cross over distortion in amplifiers.
4.21. Explain the choice of Class A, Class B Class AB Amplifier and Class C Amplifiers
4.22. State the necessity of heat sink for a power transistor.
4.23. Mention different types of heat sinks and their mounting methods.

5.0. **Understand the working of oscillators and special semiconductor devices.**
5.1. Classify tuned amplifiers.
5.2. Draw and explain single tuned and double tuned amplifier circuit.
5.3. Draw and explain class C tuned amplifier circuit with waveforms.

5.4. Mention the applications of Class C Amplifiers as Harmonic Generator and Frequency multiplier

5.5. Define an oscillator

5.6. State the condition for an amplifier to work as an Oscillator

5.7. Mention the requisites of an oscillator.

5.8. State Barkhausen criteria in oscillators.

5.9. Classify oscillator circuits.

5.10. Draw and explain the working of an R.C phase shift oscillator circuit

5.11. write the condition for sustained frequency of oscillation.

5.12. Draw and explain the working of Hartely oscillator circuit and write condition for sustained frequency of oscillation.

5.13. Draw and explain the working of Colpitts oscillator circuit and write condition for sustained frequency of oscillation.

5.14. Draw the equivalent circuit of crystal and explain.

5.15. Draw and explain the working of transistor crystal oscillator circuit.

5.16. List the advantages of crystal oscillators over other types

5.17. State the reasons and suggest remedies for instability in oscillator.

6.0 Understand the working of Special Semiconductor Devices

6.1. Mention the function of varactor diode

6.2. Draw the symbol of Varactor diode and name the terminals

6.3. Explain the working principle of varactor diode. and draw characteristics.

6.4. List the application of varactor diode

6.5. Draw the symbol of UJT and name the terminals

6.6. Explain the construction and working principle of UJT

6.7. Draw the equivalent circuit of UJT

6.8. Explain the I/V characteristics of UJT

6.9. Explain negative Resistance of UJT

6.10. Mention 3 important applications of UJT

6.11. Explain Photoconductivity principle of Photodiode

6.12. Explain the operation & characteristics of photo diode under reverse bias

6.13. Explain operation & characteristics of photo transistor.

6.14. Explain the principle of photovoltaic cell.

6.15. List three applications of Photo diode , Photo t5ransistor and Photovoltaic cell (for each)

6.16. Explain The working principle of LED

6.17. Explain the V/I characteristics of LEDs of different colours

6.18. Explain the working of an opto-coupler

6.19. List three applications of Optocoupler

6.20. Explain the working principle of Liquid crystal display(LCD)

6.21. Mention different types of LCDs

6.22. Give constructional details of LCD

6.23. List the 4 important merits and demerits of LCD Displays

6.24. List three Important applications of LCDs

COURSE CONTENT:

1.16. FETs AND MOSFETs.

Compare JFET and BJT-List the merits of JFET over BJT- principle of operation of n-channel JFET - drain characteristics of JFET- pinch-off voltage of JFET- mutual characteristics of JFET. -important parameters of JFET - important specifications of JFET- applications of JFET -use of JFET as current source – JFET classification - Construction and principle of -operation of depletion type n-channel MOSFET.-Explain the construction and principle of operation of enhancement type n-channel MOSFET.- JFET and MOSFET Comparison - Principle of operation of CMOSFET.

2.0 **Understand the working of small signal amplifiers.**

Basic amplifier concept using BJT-CE mode.- Reason for wide use of CE amplifier- Concept of DC and AC load line- Selection of operating point on DC load line with waveforms.- Factors affecting the Q-point.- Thermal –runaway- Need for proper biasing in amplifier circuits- Types of biasing circuits- Stabilization in amplifier circuits.- Various stability factors (S, S_β, S_{VBE})- Expression for stability factor in CE configuration- Fixed bias circuit and its stability factor-

Collector to base resistor method of biasing and its stability-factor- Self bias circuit and its stability factor. Single stage RC Coupled CE amplifier- Merits of Resistor -Capacitor coupling - Biasing Resistors, Coupling capacitor ,Emitter Bypass capacitor , Emitter Resistor and Load Resistor of CE Amplifier - Purpose of each component in RC coupled CE amplifier circuit- Gain, frequency response and bandwidth of an amplifier- Reasons for fall in gain at both low and high frequencies in RC coupled amplifier- h-parameters of a transistor.- Circuit of common source FET amplifier

3.0 Understand the working of Feedback and Power amplifiers.

Draw the basic block diagram of a feedback amplifier and explain-Derive the expression for gain in a feedback amplifier-Explain negative and positive feedback-Draw the block diagrams of voltage series feedback amplifier-Draw the block diagrams of voltage shunt feedback amplifier-Draw the block diagrams of current series feedback amplifier-Draw the block diagrams of current series feedback amplifier-State the effect of negative feedback on gain, bandwidth, input and output-impedances-List the advantages of negative feedback amplifiers.-Compare characteristics of above feedback amplifiers -Explain Voltage series feedback using Emitter follower amplifier circuit

4.0 Understand the working of Power Amplifier Circuits

Classification of amplifiers based on coupling, feedback , frequency and Power- Need for multi-stage amplifiers- Need for a power amplifier- Voltage and Power amplifiers- Block diagram of power amplifier-Classification of power amplifiers based on conduction-performance measures of power amplifier- (Class A, B, AB & C)-Draw the input and output waveforms of Class A, Class B, Class AB & Class C amplifiers –Comparision of different types of amplifiers(A,B,AB & C)- Circuit of class A amplifier with resistor load - Expression for efficiency - Class A amplifier with transformer load - Expression for efficiency of the above circuit- Operation of class-B push-pull amplifier- Efficiency of class-B push-pull amplifier-Write the advantages & disadvantages of push-pull amplifier- Complementary symmetry push-pull amplifier - Effect of distortion in amplifiers- Distortions in power amplifiers- Amplitude distortion and Cross over distortion in amplifiers- Choice of Class A, Class B Class AB Amplifier and Class C Amplifiers - Necessity of heat sink for a power transistor.- Different types of heat sinks and mounting methods.

5.0 Understand the working of oscillators and special semiconductor devices.

Classification of tuned amplifiers.- Single tuned and double tuned amplifier circuit- Class C tuned amplifier circuit with waveforms-Applications of Class C Amplifiers as Harmonic Generator and Frequency multiplier-Definition of an oscillator- Condition for an amplifier to work as an Oscillator - Requisites of an oscillator- Barkhausen criteria in oscillators- Classification of oscillator circuits- R.C phase shift oscillator circuit - Condition for sustained oscillation and frequency of oscillation- Hartely oscillator - Condition-for sustained oscillation -Draw and explain the working of Colpitts oscillator circuit and write condition for sustained oscillation - Equivalent circuit of crystal - Working of transistor crystal oscillator - Advantages of crystal oscillators over other types- Reasons and remedies for instability in oscillator.

6.0 Understand the working of Special Semiconductor Devices

varactor diode- symbol of Varactor diode - working principle of varactor diode. – characteristics-application of varactor diode - symbol of UJT and name the terminals- Construction and working principle of UJT- equivalent circuit of UJT - I/V characteristics of UJT- negative Resistance of UJT-Mention 3 important applications of UJT - Photoconductivity principle of Photodiode - Operation & characteristics of photo diode under reverse bias -Operation & characteristics of photo transistor.- Principle of photovoltaic cell.- Applications of Photo diode , Photo transistor and Photovoltaic cell (for each)- Principle of LED-Explain the V/I characteristics of LEDs of different colours-Opto-coupler- Applications of Optocoupler- Liquid crystal display(LCD)-Mention different types of LCDs - constructional details of LCD- Merits and demerits of LCD Displays- Important applications of LCDs

REFERENCE BOOKS:

1. Electronic Devices and Circuits by .David A.Bell 4th edition PHI
2. Electronic Devices and Circuits – T.F. Bogart Jr, J.S.Beasley and G. Rico, Pearson Education,6th edition, 2004.
3. Electronic Principles by Albert Malvino. – J Bates. 7th edition Tata McGraw-Hill Education (TMH) Publishers.
4. Principles of Electronics by V.K. Mehta. S Chand & Company, 2008

EC 303- NETWORK ANALYSIS

Subject title : Network Analysis

Subject code : EC-303

Periods/week : 05

Periods/semester : 75

Rationale: Network analysis is a core subject which gives a clear insight in to the Electronics &communication Engineering. Care has been taken to limit the Mathematical treatment, just appropriate for a diploma holder

TIME SCHEDULE

S.No.	Major topics	No. of periods	Weight age of marks	Short Answer Questions	Essay Questions
1	Basics of electrical circuits and Kirchhoff's laws	10	16	2	1
2	Network theorems	15	26	2	2
3	Mesh current and Node voltage analysis	16	26	2	2
4	Transient analysis	10	13	1	1
5	Two port networks	12	13	1	1
6	Filters and Attenuators	12	16	2	1
	Total	**75**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student should be able to

1.0 Understand the basics of electrical circuits and Kirchhoff's laws

1.1 Define active and passive elements.

1.2 Define energy source and classify the energy sources.

1.3 Explain ideal voltage source and ideal current source

1.4 Convert ideal voltage source to ideal current source and vice versa.

1.5 State limitations of Ohm's law.

1.6 State Kirchhoff's current law and Kirchhoff's voltage law.

1.7 Solve simple problems using Kirchhoff' s Voltage Law

1.8 Solve simple Problems using Kirchhoff's Current law

1.9 Explain the concept of mutual inductance as a circuit parameter

1.10 Mention the formula for coupling coefficient

1.11 Explain the Dot rule for coupled circuits

1.12 Explain the phenomenon of reflected coupled impedance.

1.13 Explain the phenomenon of coupled impedance in single tuned circuits.

1.14 Explain the phenomenon of coupled impedance in double tuned circuits.

1.15 Define the critical coupling, loose coupling and tight coupling.

1.16 Explain the reasons for double humps in tight coupled circuits.

1.17 List applications of tuned circuits

2.0 Understand network theorems

2.1 State Thevenin's and Norton's theorem.

2.2 Apply the above theorems to solve networks.

2.3 Explain the use of above theorems in electronic circuits

2.4 State superposition theorem

2.5 Solve simple problems using the above theorem

2.6 State Maximum power transfer theorem.

2.7 Solve simple problems using the above theorem.

2.8 Explain the importance of impedance matching for maximum power transfer.

2.9 State Reciprocity theorem

2.10 Explain the importance of Reciprocity theorem by giving examples like Co axial cable and flat twin lead cable used in Television systems.

2.11 List the advantages and limitations of above theorems.

2.12 Explain star and Delta configurations of resistances.

2.13 Give transformation formulas from Star to Delta & Delta to Star (no derivation).

2.14 Solve simple problems on Star/Delta and Delta/Star transformation.

3.0 Apply Mesh current analysis and Node voltage analysis

3.1 Explain the concept of graph of a network

3.2 Define, branch, nodes, junction and loop in circuits.

3.3 Define tree, co-tree, twigs and links.

3.4 Obtain the tie set tie-set matrix and cut set matrix for a given network graph.

3.5 Identify the mesh currents.

3.6 Determine the number of mesh equations required to solve the given Network

3.7 Write the mesh current equations for a given network and arrange them in matrix form.

3.8 Solve for mesh currents using Crammer's rule.

3.9 Apply super mesh technique to find the mesh current for the circuits having current sources.

3.10 Identify the nodes in a network.

3.11 Determine the number of node voltage equations.

3.12 Write the node voltage equation for a given network and arrange them in matrix form.

3.13 Solve for node voltages using Crammer's rule.

3.14 Apply super node technique to find the node voltage for the circuits having voltage sources.

3.15 Explain duality of a network

3.16 Draw the dual of given network.

4.0 Understand the transient analysis.

4.1 Define the terms initial conditions, steady state and transient.

4.2 Explain the dc response for an RL circuit.

4.3 Derive expression for current for an RL circuit.

4.4 Explain the dc response for an RC circuit.

4.5 Derive expression for current for an RC circuit.

4.6 Explain the dc response for an RLC circuit.

4.7 Solve simple problems on series RL, RC circuits of DC excitation.

4.8 Explain RC differentiator circuit

4.9 Draw input/output waveforms for RC differentiator circuit

4.10 Explain RC integrator circuit

4.11 Draw input/output waveforms for RC integrator circuit

5.0 Understand the Two port networks

5.1 Define port.

5.2 Explain the open circuit impedance (Z) parameters with equivalent circuit.

5.3 Explain the short circuit admittance(Y) parameters with equivalent circuit.

5.4 Explain the hybrid (h) parameters with equivalent circuit.

5.5 Explain the Transmission (ABCD) parameters.

5.6 Give the conditions for symmetry in terms of Z,Y, h, ABCD parameters.

5.7 Give conditions for reciprocity in terms of Z,Y,h,ABCD parameters

5.8 Find the Z- parameters for a given T- network and Y parameters for a π-network

5.9 Give Examples for symmetric networks

5.10 Give Examples for Reciprocal networks

6.0 Understand the filters and attenuators

6.1 Define neper, decibel, characteristic impedance, propagation constant, Attenuation

6.2 Define filter, LPF, HPF, BPF, BSF.

6.3 Draw the characteristic curves for the above

6.4 Derive the expression for characteristic impedance for T and π network.

6.5 Give the expression for fc for constant k-LPF, HPF.

6.6 Design a simple LPF and HPF for a given cut off frequency and given impedance.

6.7 Design a T-type attenuator for the given attenuation and characteristic impedance.

6.8 Design a π-type attenuator for the given attenuation and characteristic impedance.

6.9 Define the equalizer circuit

6.10 Draw the circuit of equalizer circuit.

6.11 List the applications of equalizer circuit.

COURSE CONTENT:

1.0 Basics of electrical circuits and Kirchoff's laws

Active and passive elements- resistance, capacitance and inductance parameters- Energy source and classify the energy sources- Ideal voltage source and Ideal current source- Ideal voltage source to ideal current source and vice versa- Limitations of Ohm's law- Kirchhoff's current law and Kirchhoff's voltage law-Solve simple problems using Kirchhoff' s Voltage Law -Solve simple Problems using Kirchhoff's Current law- Concept of mutual inductance as a circuit parameter- Formula for coupling coefficient- Dot rule for coupled circuits- phenomenon of reflected coupled impedance- Phenomenon of coupled impedance in single tuned circuits- Phenomenon of coupled impedance in double tuned circuits - Critical coupling, loose coupling and tight coupling- Reasons for double humps in tight coupled circuits- Applications of tuned circuits

2.0 Network theorems

Thevenin's, and Norton's theorems - Solve networks- Use of above theorems in electronic circuits- Superposition theorem - Maximum power transfer theorems-Solve simple problems using the above theorem- Importance of impedance matching for maximum power transfer- Reciprocity theorem- Importance of Reciprocity theorem - advantages and limitations of above theorems- Star and Delta configurations of resistances- Formulas from Star to Delta & Delta to Star (no derivation)-Solve simple problems on Star/Delta and Delta/Star transformation.

3.0 Mesh current analysis and Node voltage analysis

Concept of graph of a network - branch, nodes, junction and loop in circuits- tree, co-tree, twigs and links- Tie set tie-set matrix and Cut set matrix for a given network graph- Mesh currents- Number of mesh equations required to solve the given Network- Mesh current equations for a given network and arrange them in matrix form-Solve for mesh currents using Crammer's rule-Super mesh technique to find the mesh current for the circuits having current sources- Nodes in a network- Number of node voltage equations- Node voltage equation for a given network and arrange them in matrix form- Node voltages using Crammer's rule- Super node technique to find the node voltage for the circuits having voltage sources- Duality of a network

4.0 Transient analysis.

Initial conditions, steady state and transient- DC response for an RL circuit- Expression for current for an RL circuit- DC response for an RC circuit- Expression for current for an RC circuit- DC response for an RLC circuit-Solve simple problems on series RL,RC circuits of DC excitation- RC differentiator circuit - Input/output waveforms for RC differentiator circuit- RC integrator circuit- Input/output waveforms for RC integrator circuit

5.0 Two port networks

Definition of port.- Open circuit impedance (Z) parameters with equivalent circuit.- Short circuit admittance(Y) parameters with equivalent circuit-Explain the hybrid (h) parameters with equivalent circuit- Transmission (ABCD) parameters- Conditions for symmetry in terms of Z,Y, h, ABCD parameters- conditions for reciprocity in terms of Z,Y,h,ABCD parameters- Z- parameters for a given T-network and Y parameters for a π-network- Examples for symmetric networks- Examples for Reciprocal networks

6.0 Filters and Attenuators

Definition of neper, decibel, characteristic impedance, propagation constant, Attenuation- Definition of filter- LPF, HPF, BPF, BSF- Characteristic curves for the above- Expression for characteristic impedance for T and π network- Expression for fc for constant k-LPF, HPF- Design of a simple LPF and HPF for a given cut off frequency and given impedance- Design of a T-type attenuator for the given attenuation and characteristic impedance.-

Design of a π-type attenuator for the given attenuation and characteristic impedance- Equalizer circuit-.- Applications of equalizer circuit.

REFERENCE BOOKS:

1. Network Analysis by M.E Van Valkenberg, Prantice Hall India, 3rd Edition
2. .Electric Circuits -Joseph Edminister ,Schaum Series publishers.
3. Circuits & Networks by A. Sudhakar and Shyammohan S Palli Tata McGraw- Hill
4. Electric circuit theory . Dr. M. Arumugam& Dr. N. Premkumaran Khanna Publishers, New Delhi
5. *A Course in Electrical Circuit Analysis by Soni and Gupta, "Dhanpat Rai & Sons*

ANALOG COMMUNICATION

Subject title : A**nalog Communication**

Subject code : EC-304

Periods/week : 05

Periods/semester : 75

Rationale: Analog communications is another core subject which forms the basis for Communication Engineering. Hence understanding of Analog Communication is very much essential for an electronics and communication engineering student not only from the industry point of view but also from knowledge perspective also. Stress is laid on the study of fundamentals. This course serves as a foundation for other advanced courses.

TIME SCHEDULE

Sl	Major topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Basics of Communication System & Noise	15	16	2	1
2	Analogue modulation techniques	15	26	2	2
3	Transmitters & Receivers	15	26	2	2
4	Wave propagation	15	26	2	2
5	Antennas	15	16	2	1
Total		**75**	**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 Communication systems.

1.1 Describe the basic elements of a communication system with block diagram.

1.2 Explain frequency 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

1.6 Draw the wave form of an AM wave

1.7 Define Frequency modulation

1.8 Draw the waveform of FM Wave

1.9 Define phase modulation

1.10 Distinguish between baseband, carrier, and modulated signals and give examples.

1.11 Explain the relationship between channel bandwidth, baseband bandwidth and transmission time.

1.12 List causes of distortion in transmission and measures for distortion less transmission.

1.13 Explain the terms time domain and frequency domain.

1.14 Classify different types of noise

1.15 Distinguish between internal and external Noise

1.16 Define signal to noise ratio, noise figure and noise temperature

2.0 Understand the principles of Analogue 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 Solve simple problems

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 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 Compare AM , FM and PM

2.17 Explain narrow band and wide band FM

2.18 Define pre-emphasis and de-emphasis

2.19 State the need for pre-emphasis and de-emphasis in FM

3.0 Understand the working of 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

3.6 Explain the function of each block.

3.7 Draw the block diagram of indirect FM transmitter (Armstrong method& PLL method).

3.8 Explain the function of each block.

3.9 Draw the block diagram of TRF receiver

3.10 Explain the function of each block.

3.11 State the limitations of TRF Receiver.

3.12 Explain the need for super heterodyning in radio receiver.

3.13 Explain the working of super heterodyne receiver with a block diagram.

3.14 Explain the choice of IF.

3.15 Define sensitivity, selectivity and fidelity, image rejection ratio

3.16 Explain the need for AVC (AGC).

3.17 Explain the process of demodulation in AM receivers.

3.18 Draw the block diagram of FM receiver.

3.19 Explain the function of each block.

3.20 Explain Foster-Seely discriminator.

4.0 Understand the methods of wave propagation

4.1 Explain the properties of electromagnetic waves (Absorption, attenuation)

4.2 Define power density and electric field intensity

4.3 Calculate power density and electric field intensity for waves propagating in free space.

4.4 Define polarization of EM waves

4.5 Explain vertical and horizontal polarization.

4.6 Define the characteristic impedance of free space.

4.7 Explain reflection, refraction, diffraction and interference of EM waves.

4.8 List 4 types of wave propagation methods

4.9 Explain ground wave propagation

4.10 Explain sky wave propagation

4.11 Explain different layers in ionosphere

4.12 Define the terms critical frequency, MUF, skip distance and virtual height in sky wave propagation.

4.13 Explain space wave propagation

4.14 Define the term line of sight

4.15 Give the expression for LOS

4.16 Define fading

4.17 Explain the methods of diversity to reduce fading effects

4.18 Explain duct propagation

4.19 Explain tropospheric scatter propagation.

5.0 Understand the working Principle of antennas

5.1 Explain the principle of an antenna

5.2 Define radiation pattern

5.3 Define isotropic antenna and draw its radiation pattern

5.4 Explain an elementary doublet

5.5 Explain half wave dipole and give its radiation pattern

5.6 Define the terms power gain, directivity, beam width, radiation resistance and front to back ratio of an antenna..

5.7 Explain the terms antenna impedance and polarization.

5.8 Explain the concept of grounding.

5.9 State the need for folded dipole.

5.10 State the need of antenna array.

5.11 Explain the operation of broadside and end fire arrays.

5.12 Define resonant and non-resonant antennas

5.13 Explain the working of Rhombic antenna.

5.14 Explain the working of Yagi-Uda antenna.

5.15 Explain turnstile antenna

5.16 State the need for binomial array

5.17 Explain the principle of parabolic reflector.

5.18 Explain different feed arrangements

5.19 Explain the working of Horn and Loop antennas

5.20 Explain the working of Helical antenna

5.21 List the applications of dish antenna

COURSE CONTENT

1.0 Basics of Communication systems.

elements of a communication system - block diagram- frequency spectrum - frequencies for different applications- modulation- need for modulation in communication systems- amplitude modulation- wave form of an AM wave- Frequency modulation - waveform of FM Wave- phase modulation- baseband, carrier, and modulated signals - relationship between channel bandwidth, baseband bandwidth and transmission time- causes of distortion in transmission - measures for distortion less transmission- time domain and frequency domain- types of noise- internal and external Noise- signal to noise ratio, noise figure and noise temperature

2.0 Analogue Modulation Techniques

time-domain equation for an AM signal- modulation index of an AM signal- frequency spectrum of an AM signal- effects of over modulation- bandwidth of an AM signal- relation between total power and carrier power in AM-Solve simple problems- need for DSBSC and SSB modulation- advantages and disadvantages of SSB- applications of SSB- Vestigial side band transmission angle modulation- types of angle modulation- time domain equation for FM signal- modulation index of an FM signal- noise triangle in FM-Comparison of AM , FM and PM- narrow band and wide band FM- pre-emphasis and de-emphasis- need for pre-emphasis and de-emphasis in FM

3.0 Transmitters and Receivers.

requirements and specifications of transmitters- block diagram for high level modulated transmitter - low level modulated Transmitter -Distinguish between low level and high level modulation- block diagram of basic SSB transmitter - block diagram of indirect FM transmitter (Armstrong method)- block diagram of TRF receiver - limitations of TRF Receiver- need for super heterodyning in radio receiver- working of super heterodyne receiver - block diagram- choice of IF- sensitivity, selectivity and fidelity, image rejection ratio- AVC (AGC)-Explain the process of demodulation in AM receivers- block diagram of FM receiver - Foster-seely discriminator.

4.0 Wave propagation

properties of electromagnetic waves (Absorption, attenuation)- power density and electric field intensity- power density and electric field intensity for waves propagating in free space- polarization of EM waves- vertical and horizontal polarization- characteristic impedance of free space- reflection, refraction, diffraction and interference of EM waves- types of wave propagation methods- ground wave propagation- sky wave propagation- different layers in ionosphere- critical frequency, MUF, skip distance and virtual height in sky wave propagation- space wave propagation- line of sight - expression for LOS- fading- methods of diversity to reduce fading effects- duct propagation- tropospheric scatter propagation-

5.0 Antennas

principle of an antenna- radiation pattern- isotropic antenna - radiation pattern- elementary doublet- half wave dipole and give its radiation pattern- power gain, directivity, beam width, radiation resistance- and front to back ratio of an antenna- antenna impedance and polarization- concept of grounding- need for folded dipole- antenna array- operation of broadside and end fire arrays- resonant and non-resonant antennas - construction and working of Rhombic antenna- working of Yagi-Uda antenna- turnstile antenna- binomial array- principle of parabolic reflector- different feed arrangements- working of Horn and Loop antennas- Helical and Log periodic antenna - applications of dish antenna

REFERENCE BOOKS:

1. Electronic communications systems by Roy Blake, Thomson Delmar,2002.
2. Electronic Communication System by George Kennedy- Bernard DavisTata Mcgraw Hill Education Private Limited
3. Principles Of Electronic Communication Systems by Herbert Taub& Donald L Schilling, 3rd Edition-2009**.**McGraw Hill Education (India) Private Limited
4. Radio communication by G.K.Mithal- khanna publishers
5. Antennas and Wave propagation by K.D.Prasad- SathyaPrakasahan Publications.

DIGITAL ELECTRONICS

Subject Title : DIGITAL ELECTRONICS
Subject Code : : 305
Periods/Week : 5
Periods/Semester : 75

Rationale: Digital Electronics is a core subject as Digital Electronics form the basis for Digital Communication and Microcontrollers .Hence the understanding of Digital electronics and their applications is very much essential for an electronics and communication engineering from the industry point of view Stress is laid on study of the behaviour of various devices and circuits including practical applications. This course serves as a foundation for other advanced courses.

TIME SCHEDULE

Sl	Major topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Basics of Digital Electronics	12	19	3	1
2	Logic Families	6	13	1	1
3	Combinational Logic circuits	14	26	2	2
4	Sequential Logic Circuits	12	26	2	2
5	Counters and Semiconductor Memories	16	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 Digital Electronics

1.1 Explain Binary, Octal, Hexadecimal number systems.

1.2 Compare the above with Decimal system.

1.3 Convert a given decimal number into Binary, Octal, and Hexadecimal numbers and vice versa.

1.4 Convert a given binary number into octal and hexadecimal 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)

1.11 Explain the importance of parity Bit.

1.12 State different postulates in Boolean algebra.

1.13 Explain the basic logic gates AND, OR, NOT gates with truth table.

1.14 Explain the working of universal logic gates (NAND, NOR gates) using truth tables.

1.15 Explain the working of an exclusive – OR gate with truth table.

1.16 State De-Morgan's theorems.

1.17 Explain De-Morgan's theorems

1.18 Realize AND, OR, NOT operations using NAND, NOR gates.

1.19 Apply De-Morgan's theorems related postulates to simplify Boolean expressions (up to three variables).

1.20 Explain standard representations for logical functions (SOP and POS form)

1.21 Write Boolean expressions from the given truth table.

1.22 Use Karnaugh map to simplify Boolean Expression (up to 4 variables only)

2.0 Understand different logic families.

2.1 Give the classification of digital logic families (like TTL, CMOS and ECL).

2.2 List the important characteristics of Digital ICs

2.3 Explain logic levels and Voltage requirements of TTL and CMOS ICs

2.4 Define propagation delay and Noise margin,

2.5 Explain Fan-in and Fan-out capacity of a digital IC.

2.6 Explain Power dissipation.

2.7 Explain figure of merit of a logic family

2.8 Explain the working of open collector TTL NAND gate with a circuit diagram.

2.9 Explain the working of Totem pole output TTL NAND gate with a circuit diagram.

2.10 Explain the working of CMOS NAND gate with a circuit diagram.

2.11 Compare the TTL, CMOS and ECL logic families.

2.12 Give IC numbers of different two input Digital IC Logic gates(One for each type)

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

3.3 Verify its functionality using truth table.

3.4 Realize a Half-adder using i) NAND gates only and ii) NOR gates only.

3.5 Explain the operation of full adder circuit with truth table.

3.6 Realize full-adder using two Half-adders and an OR – gate

3.7 Write truth table for the above circuit.

3.8 Explain the working of 4 Bit parallel adder circuit using full adders.

3.9 Explain 2's compliment parallel adder/ subtractor circuit.

3.10 Explain the working of a serial adder circuit.

3.11 Compare the performance of serial and parallel adder.

3.12 Explain the working of 4 X 1 Multiplexer circuit.

3.13 Give the IC numbers of TTL & CMOS Multiplexer ICs

3.14 Mention any 3 applications of multiplexer circuit

3.15 Explain the working of 1 to 4 demultiplexer circuit.

3.16 Give the IC numbers of TTL & CMOS De-multiplexer ICs

3.17 Mention any 3 applications of De-multiplexer

3.18 Explain the working of 3 X 8 decoder circuit.

3.19 Mention any 3 applications of decoder IC

3.20 Explain the working of BCD to decimal decoder circuit.

3.21 Explain the working of Decimal to BCD encoder circuit.

3.22 State the need for a tri-state buffer

3.23 List the two types of tri-state buffers with IC numbers

3.24 Mention the use of Tristate buffer in digital circuits.

3.25 Explain the working of 2 bit digital comparator circuit.

4.0 Understand the working of Sequential logic circuits

4.1 Explain 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 and edge triggering,

4.5 Explain clocked SR flip flop circuit using NAND gates.

4.6 Explain the need for preset and clear inputs.

4.7 Explain the circuit of level clocked JK flip flop (using S-R flip-flops) with truth table

4.8 Explain the race around condition.

4.9 Explain the working of master slave JK flip flop circuit with necessary diagrams

4.10 Explain the level clocked D and T flip flops with the help of truth table and circuit diagram and timing diagram.

4.11 Draw the symbols of above Flip Flops.

4.12 Give the truth tables of edge triggered D and T flip flops

4.13 List two applications for each type of flip flop.

4.14 State the need for a Register

4.15 List the four types of registers.

4.16 Explain the working of 4 bit shift left and shift right registers with a circuit and timing diagram

4.17 Explain the working of 4-bit bi-directional shift register with a circuit and timing diagram

4.18 Explain parallel in parallel out shift register with a circuit and timing diagram

4.19 Explain the working of Universal shift register (74194) with a circuit and timing diagram

4.20 List the four common applications of shift registers.

5.0 Understand working of Counters and Semiconductor memories

5.1 Define modulus of a counter

5.2 Explain the working of 4-bit asynchronous counter with a circuit and Timing diagram.

5.3 Explain the working of asynchronous decade counter with a circuit and Timing diagram.

5.4 Explain the working of asynchronous 3 bit up-down counter with a circuit and Timing diagram

5.5 Explain the working of 4-bit synchronous counter with a circuit and Timing diagram.

5.6 Distinguish between synchronous and asynchronous counters.

5.7 List any 2 commonly used IC numbers of flip flops, registers and counters for each.

5.8 Explain the working of ring counter

5.9 Give three applications for the above circuit

5.10 Classify various types of memories based on principle of operation, physical characteristics, accessing modes and fabrication technology..

5.11 Explain the terms memory read operation, write operation, access time, memory capacity, and address lines and word length.

5.12 Differentiate between ROM and RAM

5.13 Explain basic principle of working of diode ROM

5.14 Distinguish between EEPROM and UVPROM.

5.15 Explain the working of basic dynamic MOS RAM cell.

5.16 Compare static RAM and dynamic RAM

5.17 List the applications of Flash ROM

COURSE CONTENT

1.0 Basics of Digital Electronics

Binary, Octal, Hexadecimal number systems –comparison with Decimal system-Conversion of a given decimal number into Binary, Octal, and Hexadecimal numbers and vice versa-Conversion of a given binary number into octal and hexadecimal number system and vice versa- binary addition, subtraction, Multiplication and Division- 1's complement and 2's complement numbers of a binary number- subtraction of binary numbers in 2's complement method- Use of weighted and Un-weighted codes- Binary equivalent number for a number in 8421, Excess-3 and Gray Code and vice-versa- Use of alphanumeric codes (ASCII & EBCDIC)-importance of parity Bit- Different postulates in Boolean algebra- Basic logic gates AND, OR, NOT gates with truth table- universal logic gates (NAND, NOR gates) - exclusive – OR gate with

truth table- De-Morgan's theorems- AND, OR, NOT operations using NAND, NOR gates- De-Morgan's theorems related postulates to simplify Boolean expressions (up to three variables)- standard representations for logical functions (SOP and POS form)- Boolean expressions from the given truth table- Karnaugh map to simplify Boolean Expression (up to 4 variables only)

2.0 Different logic families.

Classification of digital logic families- Important characteristics of Digital ICs-Logic levels and Voltage requirements of TTL and CMOS ICs - Propagation delay and Noise margin- Fan-in and Fan-out capacity- Power dissipation- Figure of merit of a logic family- explain TTL NAND gate with open collector- TTL NAND gate with Totem pole output- CMOS NAND gate circuit – Compare TTL, CMOS and ECL logic families- IC numbers of two input Digital IC Logic gates.

3.0 Combinational logic circuits

Concept of combinational logic circuits- Half adder circuit -truth table- Half-adder using NAND gates only &NOR gates only- Full adder circuit - Truth table- Full-adder using two Half-adders and an OR – gate - a 4 Bit parallel adder using full – adders- 2's compliment parallel adder/ subtractor circuit- Serial adder -Performance of serial and parallel adder- Operation of 4 X 1 Multiplexers- Operation of 1 to 4 demultiplexer- IC numbers -applications- 3 X 8 decoder- BCD to decimal decoder- Decoders- Decimal to BCD encoder- IC numbers -Applications - Tri-state buffer - Types of tri-state buffers-Applications - Digital comparator.

4.0 Sequential logic circuits

Concept of Sequential logic circuits- NAND and NOR latches with truth tables

Necessity of clock - Concept of level clocking and edge triggering,

Clocked SR flip flop circuit using NAND gates- Need for preset and clear inputs - Circuit of level Clocked JK flip flop (using S-R flip-flops) with truth table

Race around condition- Master slave JK flip flop circuit - Level clocked D and T flip flops - Truth table, Circuit diagram and timing diagram- Symbols of above Flip Flops- Truth tables of edge triggered D and T flip flops - Applications for each type of flip flop- Need for a Register - Types of registers- 4 bit shift left and shift right registers - 4-bit bi-directional shift Register - Parallel in parallel out shift register - Universal shift register (74194) - Applications of shift registers

5.0 Counters and Semiconductor memories

Modulus of a counter- 4-bit asynchronous counter - Asynchronous decade counter with a circuit - 4-bit synchronous counter –Differences between synchronous and asynchronous counters-

asynchronous 3 bit up-down counter - IC numbers of flip flops, Registers and counters - Ring counter- applications - Types of memories - Memory read operation, write operation, access time, memory capacity, address lines and word length- ROM and RAM- Diode ROM- EEPROM and UVPROM- Dynamic MOS RAM cell- static RAM and dynamic RAM- Applications of Flash ROM.

REFERENCE BOOKS:

1. Digital Computer Electronics by Malvino and leach. 3rd edition Tata McGraw-Hill Education

2. Modern Digital Electronics By RP JAIN TMH

3Digital Electronics: Principles & Applications by Roger L. Tokheim -McGraw-Hill Education, 2008

4. Digital Electronics by GK Kharate, Oxford University Press.

EC-306 Electronic Measuring Instruments.

Subject title : Electronic Measuring Instruments.

Subject code : EC-306

Periods/week : 05

Periods/semester : 75

Rationale: Electronic Measuring Instruments is introduced in III semester to make the students understand the principles of Electronic measurements which is essential for Instrumentation industry and also to provide necessary cognitive inputs to handle equipment in the laboratory/Industry.

SNo	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1.	Analog Instruments	15	26	2	2
2	Digital Instruments	15	21	2	$1\frac{1}{2}$
3	Cathode Ray Oscilloscope	15	26	2	2
4	Signal generators	15	21	2	$1\frac{1}{2}$
5	Testing Instruments	15	16	2	1
	Total	75	110	10	8

Objectives: On completion of the study of the subject a student shoud be able to comprehend the following.

1.0. Understand the working of analog instruments.

1.1. List the characteristics of ideal volt meter and ideal ammeter.

1.2. Explain the construction and principle of operation of PMMC instrument.

1.3. Explain the principle of extending range of DC ammeter.

1.4. Explain the principle of extending range of DC voltmeter.

1.5. Explain the principle & working of rectifier type voltmeter.

1.6. Explain the principle of series & shunt type ohmmeters.

1.7. Explain the use of Megger for measuring the insulation resistance.

1.8. Explain loading effect of voltmeter with an example circuit

1.9. Explain the need for high input impedance for voltmeters.

1.10. Explain the working of FET input voltmeter with a circuit diagram.

1.11. Explain the drift problems in FET voltmeters.

1.12. Explain the working of differential voltmeters.

1.13. Explain the use of high voltage probe & clamp-on current probe.

1.14. Explain the construction of AC bridge.

1.15. State the conditions for AC bridge balance.

1.16. List 4 types of AC bridges.

1.17. Mention the use of above bridges.

1.18. Explain the resistance measurement using Wheatstone Bridge.

1.19. Explain the inductance measurement using Maxwell's Bridge.

1.20. Explain the capacitance measurement using Schering Bridge.

1.21. List 4 important errors and their prevention in bridge measurements.

2.0 **Understand the working of Digital Instruments.**

2.1 List 4 advantages of digital instruments over analog instruments.

2.2 Explain the working of RAMP type digital voltmeter with block diagram.

2.3 Explain the working of Successive approximation type digital voltmeter with block diagram.

2.4 List 4 important specifications of digital voltmeter.

2.5 Explain the working of digital frequency meter with block diagram.

2.6 List 4 important specifications of digital frequency meter.

2.7 Define accuracy and resolution of a meter.

2.8 Explain factors effecting the accuracy and resolution of a frequency meter.

2.9 Explain the working of digital LCR meter with block diagram.

2.10 List 4 specifications of digital LCR meter.

3.0 **Understand construction and working of CRO.**

3.1 Draw the block diagram of general purpose CRO and describe the function of each

block.

3.2 Explain the necessity of time base and deflection amplifiers.

3.3 Define deflection sensitivity of CRO.

3.4 List the conditions for stationary waveforms.

3.5 Mention the conditions for flicker free waveforms.

3.6 Explain the triggered sweep with necessary circuit.

3.7 Mention the advantages of triggered sweep.

3.8 Explain the function of various controls on front panel of CRO.

3.9 Explain the procedure for measurement of a) voltage (DC & AC) b) frequency c) phase angle d) time interval e) depth of modulation.

3.10 Define a pulse.

3.11 Draw the waveform of a pulse.

3.12 Define the pulse parameters a) pulse width b) rise time c) fall time d) duty cycle d) delay time.

3.13 Explain the procedure for measuring above pulse parameters with CRO.

3.14 List different types of probes and connectors used in CRO's.

4.0 **Understand the construction and working of signal generators & power meters.**

4.1 Explain the working of AF oscillator with block diagram.

4.2 List the front panel controls and specifications of AF oscillator.

4.3 Explain the working of function generator with block diagram.

4.4 List the applications of AF oscillators and function generators.

4.5 Explain the working of RF signal generator with block diagram.

4.6 List the specifications of RF signal generator.

4.7 Mention 3 important applications of RF signal generator.

4.8 Explain the importance of shielding in RF generators.

4.9 Explain the working of AF power meter.

4.10 List the applications of power meter.

5.0 **Understand the construction and working of test instruments.**

5.1 Mention the limitations of AC bridge method for measurement of small inductances and capacitances.

5.2 Define stray inductance and stray capacitance of a coil.

5.3 Explain the working of Q-meter with a block diagram.

5.4 List various parameters that can be measured using Q-meter .

5.5 Define distortion factor.

5.6 Explain the working of distortion factor meter with block diagram.

5.7 Explain the working of distortion factor meter with block diagram.

5.8 Explain the basic working principle of spectrum analyzer and mention its use.

5.9 State the need for plotters and recorders.

5.10 Explain the working of XY recorders.

5.11 Explain the working of plotters.

5.12 Explain the working of logic probe

COURSE CONTENT

1.0 Analogue instruments

Characteristics of ideal Voltmeter and ideal Ammeter- Construction and principle of operation of PMMC instrument- Principle of extending the range of DC ammeter- Principle of extending the range of DC voltmeter- Principle and working rectifier type voltmeter - Construction and principle of series and shunt type ohmmeters- Use of Megger for measuring the insulation resistance- loading effect with an example- Need for high input impedance for Voltmeters- working of FET input voltmeter with a circuit diagram- Drift problem in FET Voltmeters- Working of differential voltmeters- Use of high voltage probe and clamp-on current probe- Construction of AC Bridge- Conditions for bridge balance- Types of AC bridges- Use of above bridges- Resistance measurement using Wheat Stone Bridge- Inductance measurement using Maxwell's Bridge- capacitance measurement using Schering Bridge- important errors and their prevention in bridge measurements

2.0 Digital instruments

Advantages of digital instruments over Analogue instruments- Working of Ramp type digital voltmeter with block diagram- Successive approximation type digital voltmeters with block diagram- Specifications of digital voltmeters- Working of digital frequency meter with block diagram- Important specifications of digital frequency meter- Accuracy and Resolution of a meter- Factors effecting the accuracy and Resolution of a frequency meter- Working of digital LCR meter with block diagram- specifications of digital LCR meter.

3.0 Working principle and use of CRO

Block diagram of general purpose CRO - Function of each block- Necessity of time base and deflection amplifiers- Deflection sensitivity of CRO- Conditions for stationary waveforms- Conditions for flicker free waveforms- Triggered sweep with necessary circuit- Advantages of triggered sweep- Function of various controls on front panel of CRO- Procedure for measurement of - Voltage (DC & AC) b) frequency - Phase angle - Time interval - Depth of modulation-Define a pulse - Waveform of a pulse-Define the pulse parameters - Pulse width - Rise time - Fall time - Duty cycle-delay time- procedure for measuring above pulse parameters with CRO- Different types of probes and connectors used in oscilloscopes.

4.0 working principle of AF, RF signal generators and power meters

Working of AF Oscillator (sine & square) - Block diagram- Front panel controls and specifications of AF Oscillator- Working of function generator with block diagram- Applications of AF oscillators and function generators- Working of RF signal generator- Specifications of RF signal generator- Important Applications of RF signal generators- Importance of shielding in RF generators- Working of AF power meter- Applications of power meters.

5.0 Test instruments

Limitations of AC bridge method for measurement of small inductances and capacitances- Stray inductance and stray capacitance of a coil- Q meter with a block diagram- Parameters that can be measured using Q meter- Distortion factor- Distortion Factor Meter with block diagram- Digital IC tester with block diagram- Working principle of spectrum analyser and uses- Plotters and Recorders- XY recorders- plotter- logic probe.

REFERENCE BOOKS:

1. Modern Electronic Instrumentation and Measurement techniques - Albert D. Helfrick William David Cooper-PHI Publications
2. Electrical and Electronics Measurements and Instrumentation - A.K. Sawhney , Puneet Sawhney Dhanpat Rai & Company, 2010

Electronic Instrumentation - HS Kalsi ,-Tata McGraw Hill

Electronic Devices and Circuits Lab Practice

Subject title	**:**	**Electronic Devices and Circuits Lab Practice**
Subject code	**:**	**EC-307**
Periods per week	**:**	**3**
Periods / Semester	**:**	**45**

Rationale: Electronic Devices &Circuits lab is a core lab as the student is expected to understand and demonstrate practical skills in handling, identify and using different instruments and various Electronic components with ease .Emphasis is laid on imparting essential skills that are required for subsequent learning.

S.No	Major Topics	No. of Periods
I.	**Semiconductor Diodes and Rectifiers**	9
II.	**Transistors & Field Effect transistors**	12
III.	**Transistor Amplifiers and Oscillators**	12
IV.	**Special Devices**	12
	Total	45

Note : Student should complete any 15 Exercises (Sub exercises are optional)

List of Exercises :

Semiconductor Diodes and Rectifiers

1. Draw the forward & reverse characteristics of Silicon diode
   i) a) Determine Knee voltage, b) Identify Cutoff, and Linear regions
   ii) Test the diode with DMM & Analogue multimeter and identify the Terminals
   iii) Connect a 6V lamp in series with diode and observe the behaviour a) under forward and Reverse biased conditions. b) On low voltage AC supply

iv) Observe the effect of temperature on diode reverse current by heating the diode with a soldering Iron

2. Draw the forward & reverse characteristics of Zener diode and determine Breakdown Voltage
   i) Test the Zener diode with DMM & Analogue multimeter and identify the Terminals
   ii) Produce different reference voltages by using a 12V Zener diode and Resistance ladder network
   iii) Produce higher reference voltage by connecting two Zener diodes in series

3. Implement Rectifier circuits using Diodes and observe the effect of Filtering
   a) Implement Half wave rectifier with and without filter
   b) Implement Full wave rectifier with and without filter
4. Implement Bridge rectifier with and without filter
   a) Implement Voltage Doubler circuit
   b) Connect a diode IN4007 in series with a 60W 230V Lamp and test it.(Record your observations)

5. Build a Regulated power supply and draw the regulation characteristics
   a. i) using Zener diode ii) using 3 Terminal +ve Regulator
   b. i) implement a –ve 3 Terminal Regula r ii) Implement a Dual regulated power supply using both +ve and –ve 3 terminal regulators

6. Build an adjustable +ve Regulated power supply using LM 317 and Test

II. Transistors & Field Effect transistors

7. Draw Input and output characteristics of NPN Transistor and determine Beta of the transistor
   a) Plot Input & Output characteristics for CB configuration
   b) Plot Input & Output characteristics for CE configuration
   c) Test the Transistor with DMM & Analogue multimeter and identify the Terminals and Type of transistor and find the β
8. Use Transistor as a Switch

a) Turn on and turn off a relay using Transistor (BC148 as a switch.)

b) Connect a 6v lamp in series with BD139 and observe the effect of base current variation on lamp brightness .

9. Determine the effective current gain of a Darlington Pair

a) Connect two BC148 transistors in a Darlington pair and calculate the effective Beta

b) Find out the device specifications of TIP 120 from the data sheets and compare the h_{fe} with that of BD 139.

c) Connect a 6V lamp in the collector circuit of TIP120 transistor and apply few micro amperes current at the base and observe the effect.

10. Draw the input and output characteristics of JFET and determine pinchoff voltage and transconductance.

a) Test the JFET with DMM &Analogue multimeter and identify the Terminals

11. Use JFET as a current source

a) Implement a constant current source with a FET by applying appropriate gate bias

b) Practically Verify High input impedance characteristic of the gate circuit.

12. Plot the frequency response characteristics of a RC coupled Amplifier.

a) Observe the effect of connecting and disconnecting the emitter bypass capacitor on gain, and distortion.

b) Observe the effect of emitter bypass capacitor Ce on voltage across Emitter Resistance using CRO.

c) Measure the output power using ac power meter

13. Implement a) Colpitt's oscillator b) Hartley oscillator and verify the effect of Vary the tank circuit component values and observe output waveforms on CRO.

14. Implement transistor Astable multivibrator circuit and observe the waveforms on CRO.

IV. Special Semiconductor Devices

15. Plot the characteristics of a) Photodiode b) photo transistor

16. Implement a Twilight switch using a Phototransistor and a Relay

a) Replace Phototransistor with LDR and Test

17. Plot the VI characteristics of different color LEDs & determine the Vf (forward voltage drop)

a) Test the above devices with DMM & Analogue multimeter and identify the Terminals

18. plot the characteristics of i) LDR ii) Thermistor iii) VDR
    a) Test the above devices with DMM & Analogue multimeter
    b) Implement a simple Temperature controller using Thermistor and a Relay
    c) Use a VDR /Trigistor for protection against high voltage surges and verify
19. Plot the characteristics of optocoupler MCT2E
    a) Test the given optocoupler and identify its terminals
    b) Use MCT 2E to switch on a 6V lamp connected to RPS by applying a Low voltage 1.5 V signal from a cell at input
20. Implement a simple timer using 1 M Ω Resistor , 1000 mfd capacitor ,Transistor BC148 and a Relay

Competencies and Key Competencies to be achieved

Exp No.	Name of the Experiment (No of Periods)	Competencies	Key Competencies
1	To draw the forward & reverse characteristics of Silicon diode and i) Determine Knee voltage, (3) ii) Identify Cutoff, and Linear regions a) To test the diode with DMM & Analogue multimeter and identify the Terminals b) To Connect a 6V lamp in series with diode and test it on DC power supply c) To Heat the diode with a soldering Iron and observe the effect on reverse current	➢ Identify meters and equipment ➢ Use DRB, DIB, DCB and measure Voltage and current ➢ Interpret diode datasheets and find the specifications of components used in the experiment	▪ Assemble the circuit as per the circuit diagram ▪ Identify Diode terminals by observation and also with DMM & Analogue Multimeter

2	To draw the forward & reverse characteristics of Zener diode and determine Breakdown Voltage (3) a) To test the Zener diode with DMM & Analogue multimeter and identify the Terminals b) To produce different reference voltages by using a 12V Zener diode and Resistance ladder network c) To produce higher reference voltage by connecting two Zener diodes in series	➢ Test the Zener diode using DMM ➢ identify Zener Diode terminals by observation and with DMM ➢ Prepare Resistor ladder network. ➢ Connect Zener diodes in series ➢ Rig up the circuit ➢ Find the specifications of Zener diode from datasheets	▪ Assemble the circuit as per the circuit diagram ▪ identify Zener Diode terminals by observation and with DMM & Analogue Multimeter
3.	To implement Half wave rectifier with & without filter circuits and observe the ripple on CRO (3) b) To implement Full wave rectifier with and without filter and observe the ripple on CRO	➢ Draw the symbols of Transformer , Diode , Inductor and Capacitor ➢ Read the circuit Diagram ➢ Identify Diode terminals ➢ select meters and equipment ➢ Observe the polarity of capacitors. ➢ Interpret diode datasheets	▪ Assemble the circuit as per the circuit diagram ▪ Use the CRO to observe the waveforms ▪ Assess the Power supply performance in terms of ripple and % Regulation
4	To Implement Bridge rectifier with and without filter (3) a) To Implement Voltage Doubler circuit b) To Connect a diode IN4007 in series with a 60W 230V Lamp and test it	➢ Read the circuit Diagram ➢ Identify Diode terminals ➢ Select meters and equipment ➢ Rig up the circuit ➢ . Observe the polarity of capacitors. ➢ Measure & Observe the ripple on CRO	▪ Select meters and equipment ▪ Rig up the circuit ▪ Observe the polarity of capacitors. ▪ Measure & Observe the ripple on CRO

5	To build a Regulated power supply and draw the regulation characteristics (3) A. i) Using Zener diode ii) using 3 Terminal +ve Regulator B. i) Implement a –ve 3 Terminal Regulator ii) Implement a Dual regulated power supply using both +ve ad –ve 3 terminal regulators C) i) Obtain a voltage above 30V using Dual RPS in the laboratory and measure	➢ Identify Regulator terminals ➢ Find the output voltage and type from the IC Regulator number ➢ select meters and equipment ➢ Measure Voltage and current. ➢ Observe the polarity of capacitors. ➢ Use the CRO to observe the waveforms ➢ Interpret IC Regulator datasheets	▪ Identify 3 terminal Regulator and its package &pin Configuration ▪ Find the output voltage and type from the IC Regulator number ▪ 4. Use the CRO to observe the waveforms ▪ 5. Assess the Power supply performance in terms of ripple and %Regulation
6	To build an adjustable +ve Regulated power supply using LM 317 and Test (3)	➢ Identify Regulator terminals ➢ Select meters and equipment ➢ Rig up the circuit ➢ Measure Voltage and current. ➢ Observe the polarity of capacitors. ➢ Use the CRO to observe the waveforms ➢ Interpret IC Regulator datasheets	▪ select meters and equipment ▪ Measure Voltage and current. ▪ Observe the polarity of capacitors. ▪ Use the CRO to observe the waveforms
7	To draw Input and output characteristics of NPN Transistor and determine Beta of the transistor (3) a) To plot Input & Output characteristics for CB configuration	➢ Identify Transistor type & terminals with DMM ➢ Select meters and equipment ➢ Rig up the circuit ➢ Measure Voltage and	▪ ▪ Identify Transistor type& terminals with DMM ▪ Select meters and equipment

	b) To plot Input & Output characteristics for CB configuration CE configuration b) To test the Transistor with DMM & Analogue multimeter and identify the Terminals and Type of transistor and find the β	current. ➢ Note the package &differences between BC148A, 148B, 148C and BF194 from the data sheets.	▪ Rig up the circuit ▪ Measure Voltage and current.
8	To use Transistor as a Switch &Test a) To Turn on and turn off a relay using Transistor (BC148 as a switch.) (3) b) To Connect a 6v lamp in series with BD139 and observe the effect of base current variation on lamp brightness .	➢ Identify Transistor type & terminals with DMM ➢ Rig up the circuit ➢ Measure Voltage and current. ➢ Test the circuit ➢ Note the package of BD139 & specifications from datasheets	▪ Rig up the circuit ▪ Measure Voltage and current. ▪ Test the circuit
9	To determine the effective current gain of a Darlington Pair (3) a) To Connect two BC148 transistors in a Darlington pair and calculate the effective Beta b) To find out the device specifications of TIP 120 from the data sheets and compare the hfe with that of BD 139. c) To Connect a 6V lamp in the collector circuit of TIP120 transistor and apply few micro amperes current at the base and observe the effect.	➢ Identify Transistor type & terminals with DMM ➢ Rig up the circuit ➢ Measure Voltage and current. ➢ Test the circuit ➢ Note the package of BD139 & TIP120 ➢ specifications from datasheets	▪ Identify Transistor type & terminals with DMM ▪ Rig up the circuit ▪ Measure Voltage and current. ▪ Test the circuit

10	To Draw the input and output characteristics of JFET and determine pinchoff voltage and transconductance. (3) a) To test the JFET with DMM &Analogue multimeter and identify the Terminals	➢ Draw the symbols of FET, ➢ Identify the JFET terminals using DMM and multimeter ➢ Rig up the circuit ➢ Interpret the JFET characteristics and determine the pinch off voltage ➢ Interpret JFET datasheets and finding the specifications.	▪ 1.Determine the pinch off voltage ▪ Identify the ground, drain, gate and source terminals using multimeter (DMM and Analogue) also by physical observation
11	To use JFET as a current source a) To Implement a constant current source with a FET by applying appropriate gate bias (3) b) To practically Verify High input impedance characteristic of the gate circuit.	➢ Identify the JFET terminals using DMM and multimeter ➢ Rig up the circuit ➢ Measure voltage & current ➢ finding JFET current rating from data sheets	▪ Rig up the circuit &Test ▪ Measure voltage & current
12	To Plot the frequency response characteristics of a RC coupled Amplifier. (3) a) To observe the effect of connecting and disconnecting the emitter bypass capacitor on gain, and distortion. b) To observe the effect of emitter bypass capacitor Ce on voltage across Emitter	➢ 1.Identify the coupling and bypass capacitors and noting their values ➢ Measure the amplitude and frequency on CRO ➢ Observe the 3db points ➢ Apply correct level of input signal to produce the distortion less output	▪ Assemble the circuit as per the circuit diagram ▪ Identify the coupling and bypass capacitors(types, values) ▪ Observe the distortion(clipping) of signal on CRO and

	Resistance using CRO. c) To Measure the output power using ac power meter		adjusting the input for distortion less output
13	To implement a) Colpitt's oscillator b) Hartley oscillator and verify the effect of Varying the tank circuit component values and observe output waveforms on CRO. (3)	➢ Identify Tuned circuit ➢ Identify the active component and amplifier circuit . ➢ Identify feed back circuit ➢ Observe the waveforms on CRO. ➢ Vary the core of inductor & observe the effect on o/p frequency Identify the crystal in the circuit & note the component number	▪ Identify different sections in the Oscillator circuit Identify the Type of oscillator ▪ Measure amplitude and frequency of waveforms on CRO
14	To implement transistor Astable multivibrator circuit and observe the waveforms on CRO. (3)	➢ Identify transistor type & Terminals with DMM ➢ Select correct values for components ➢ Rig up the circuit ➢ Change R & C values & observe the effect on output frequency on CRO	▪ Select correct values for components ▪ Rig up the circuit ▪ Change R & C values & observe the effect on output frequency on CRO
15	To plot the characteristics of a) Photodiode b) photo transistor (3)	➢ 1.Identify the devices ➢ 2 Draw the symbols ➢ 3.Note down the component values ➢ 4.Identify photo diode terminals with DMM/multimeter	▪ Plotting the characteristics of the Photo diode, Photo transistor and LED Identify the device from the characteristics.

		5.Assemble the circuit ➢ 6.Measure Voltage &Current ➢ 7.Note the specifications	▪ Test the devices with DMM/multimeter ▪ Assemble the circuit ▪ Measure Voltage &Current
16	To Implement a Twilight switch using a Phototransistor , BC 148 ,12V Relay & Test a) Replace Phototransistor with LDR and Test (3)	➢ Select the devices ➢ Identify the Photo diode and Relay terminals with DMM/multimeter ➢ Assemble the circuit ➢ Test the circuit	▪ Identify the Photo diode and Relay terminals with DMM/multimeter ▪ Assemble the circuit ▪ Test the circuit
17	a) To Plot the VI characteristics of different color LEDs & determine the Vf (forward voltage drop) b)To test the above devices with DMM & Analogue multimeter and identify the Terminals (3)	➢ .Identify the devices ➢ 2 Draw the symbols ➢ 3.Identify LED terminals with DMM/multimeter ➢ 4. Determination of series Resistance ➢ 5.Assemble the circuit ➢ Measure voltage &Current ➢ 7.Note the specifications from the datasheets	▪ 1.Identify LED terminals with DMM/multimeter ▪ Determination of series Resistance 3.Assemble the circuit ▪ Measure voltage &Current
18	To plot the characteristics of a) LDR b) Thermistor c) VDR a) To test the above devices with DMM & Analogue multimeter b) To use a VDR /Trigistor for protection against high voltage surges and verify (3)	➢ Identify LDR , Thermistor & VDR ➢ Test the devices with DMM(Resistance Test) ➢ Rig up the circuit ➢ Measure Voltage & Current ➢ Note the device specifications from data	▪ Test the devices with DMM(Resistance Test) ▪ Rig up the circuit ▪ Measure Voltage & Current

		sheets	
19	To plot the characteristics of optocoupler MCT2E (3) a) To use MCT 2E to switch on a 6V lamp connected to RPS by applying a Low voltage 1.5 V signal from a cell at input	➢ Identify the terminals of Optocoupler MCT2E with DMM ➢ Rig up the circuit &Test ➢ Measure the voltage and Current	▪ Identify the terminals of Optocoupler MCT2E with DMM ▪ Rig up the circuit &Test ▪ Measure the voltage and Current
20	To implement a simple timer using 1 M Ω Resistor ,Transistor and a Relay	➢ Identify the components ➢ Observe polarity ➢ Rig up the circuit ➢ Test the circuit	▪ Identify the components ▪ Observe polarity ▪ Rig up the circuit ▪ Test the circuit

Communication Skills and Life Skills

(Common to all the branches)

Subject Title : Communication Skills and Life Skills
Subject Code : EC-308
No. of periods per week : 3
No. of periods per semester : 45

Communication Skills

Sl. No	Unit	Objectives	Key Competencies
1	Listening- I	• Listen for the main idea • Listen for specific details	• Learn to listen for main idea • Listen for specific details • Listen and understand varied material • Make inferences • Know appropriate vocabulary
2	Listening-II	• Listen for and identify the main idea • Listen for and identify specific details	• Learn to listen for main idea • Listen for specific details • Listen and understand varied material • Make inferences • Know appropriate vocabulary
3	Introducing |Oneself	• Introduce oneself • Learn vocabulary relevant to making introductions • Learn the difference between an informal and formal introduction	• Use formal and informal introduction appropriately • Know relevant vocabulary to talk about skills hobbies, strengths and weaknesses
4	Describing Objects	• Learn vocabulary and expressions useful for describing objects • Describe objects	• Learn to describe an object • Use relevant vocabulary
5	Reporting Past Incidents	• Report past incidents • Use appropriate grammar and vocabulary for reporting	• Use appropriate tense • Learn appropriate vocabulary • Know how to express past incidents
6	Just A Minute	• Speaking fluently and accurately for a minute	• Learn to speak on any given topic\To organize one's thought • Sequencing ideas • Know how to introduce a given topic • Learn how to give a good closure • Know and avoid common mistakes
7	Group Discussion	• Understand the concept of a group discussion	• Participate in a group discussion • Learn appropriate vocabulary and

		• Participate in a group discussion • Learn the do's and don'ts of group discussion	expressions • Use good body language • Know group dynamics • Be aware of group do's and don'ts in a group discussion • Know appropriate etiquette
8	Interview Skills	• Prepare for an interview • Face an interview	• Get the confidence to face an interview • Learn good body language • Know frequently asked questions and answer them appropriately • Learn to dress for an interview • Know the do's and don'ts

Life Skills

Sl. No	**Unit**	**Objectives**	**Key Competencies**
1	Positive Attitude	Concept of positive attitude	• Learn to think positively • Become confident
2	Goal Setting	Importance of setting goals	• Learn to set goals • Know how to achieve goals • Know about personal and professional goals
3	Time Management	To manage time in an optimum manner	• Know about time wasters • Learn to plan, prioritize, schedule • Learn to become productive • Learn to manage time productively
4	Problem Solving and Decision Making	Learn to solve problems and take appropriate decisions	• Learn the steps in problem solving • To think out of the box • Learn to solve the problems rationally
5	Creativity	To become creative	• Think innovatively • Learn to think out of the box • Learn to look at old things in a new way • Think differently
6	Managing Emotions	Understand different emotions	• Learn to manage stress • Know about anger management • Understanding and managing emotions
7	Teamwork	Importance of teamwork	• Learn to be a team player • Know the importance of teamwork • Learn the traits of a good team

			• Know the stages in a team formation
8	Leadership Skills	Concept of leadership	• Learn leadership traits • Know leadership styles • Be a future leader

Total Marks: 100

Internal: 40 marks

External: 60 marks

End Examination:

- Listening skill: **10 marks**
- Speaking Skill: **10 marks**
  (Describing Objects, Reporting past incidents, JAM)
- Interview Skills or Group Discussion: **10 marks**
- Life Skills: **30 marks**

Internal Assessment:

- Attendance, Discipline: **5 marks**
- Lab manual Submission: **15 marks**
- Classroom presentations: **20 marks**

DIGITAL ELECTRONICS LAB PRACTICE

Subject Title : Digital Electronics & eCAD Tools Lab
Subject Code : EC-309
Periods/Week : 04
Periods/Semester : 60

Rationale: This is a core lab . student is expected to understand and demonstrate practical skills in handling , identify and using different instruments and various Digital ICs with ease .Emphasis is laid on imparting practical skills useful in the industry. CAD tools part is also included to enable the students learn latest software tools used in the industry .

S. No.		Major Topics	No. of Periods
A	I	Basic Gates and Logic Families	6
	II.	Realization of Boolean Functions using Gates	9
	III.	Realization of Boolean Functions using Multiplexers and DeMultiplexers	9
	IV.	Flip Flops & Timing Circuits	9
	V.	Counters & Shift Registers	12
B	VI	Digital Circuit simulation using eCAD tools	15
			60

Note : Student should complete any 15 exercises from Part A and any 5 Exercises from Part B (sub exercises are optional)

LIST OF EXPERIMENTS

PART A

I. Basic Gates and Logic Families

1. Identify 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 Gates

a) Measure threshold voltages resulting in change of a state of a NAND gate

b) Verify the truth table of 7403 IC (open collector quad 2input NAND gate).

c) Verify the Truth table of 4073 IC

3. Realize AND, OR, NOT, functions using 2 input NAND and NOR TTL Gates

a) Implement Wire AND & Wire OR circuit and verify the truth table

b) From the data sheets find out CMOS Equivalent of above ICs

II. Realizing Boolean Functions

4. Implement XOR Logic using 2 input Nand Gates and NOR Gates and verify the truth table

5. a) Implement the given logic function with 3 variables using 2 input CMOS NAND Gates only

b)Implement given logic function with 3 variables using 2 Input CMOS NOR Gates only.

6. Implement Half adder and full adder circuits using TTL/CMOS gates and verify the truth tables.

a) Verify the truth table of BCD to 7 segment Decoder 7448 IC

7. a) Verify the Truth table of Decoder and Explore the Features of 74138 Decoder IC

b) Combine two 3 to 8 decoder to realize a 4 to 16 Decoder

8 . Verify the Truth table of 74148 Encoder IC

a) Verify the function of 74148 Encoder and write the truth table

b) Combine two 74148 Encoder and Verify the truth table

III. Realization of Boolean Functions using Multiplexers and Demultiplexers

9. Verify the Truth table and Function of Multiplexer IC 74153

a) Verify the truth table of IC 74153

b) Combine two 74153 Multiplexers ICs to realize 8:1 multiplexer

c) Implement the given function using IC 74150 16:1 line multiplexer

10. Verify the Truth table and Functions of De multiplexers (Using IC 74154)

11. 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

IV. Flip Flops & Timing Circuits

12. 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

c) Realize a clock circuit using 4093 CMOS Nand Gate , Resistor and capacitor and observe the waveform on CRO

13. 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.

V . Counters and Shift Registers

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

a) change the modulus of the counter

b)Cascade two 7490 decade counter ICs to count up to 99 or any other modulus

c) Display decimal number using 7447

d) Cascade two 7447 ICs to count up to 99

15. 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) Load the Preset inputs of CD4029 Counter with a binary number

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

17. 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

18. Identify Various Memory ICs and Note their pin Configuration from the datasheets

a) RAM b) ROM c) EPROM d) EEPROM

Part 2:eCAD TOOLS LAB PRACTICE (15 Periods)

19.Familiarization of usage of ORCAD suite /or any other software tools for the design and layout of printed circuit boards (PCBs).(3)

20. Simulate a Full wave bridge rectifier with 7805 Regulator

21. Simulate a single stage RC coupled transistor amplifier

22.Simulate a 4 bit full adder /subtractor and test.

23.Design and simulate code converters using logic gates

(i) BCD to excess-3 code and vice versa

(ii) Binary to gray and vice-versa

24.Design and simulate 16 bit odd/even parity checker /generator using IC74180

25.Design and Simulate 4 bit ripple counter with Mod-10 and Mod- 12

Competencies and Key competencies :

Exp No	Name of the Experiment	Competencies	Key competencies
1	To Identify Digital ICs and noting down pin details from data sheets(3) 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	➢ Identify digital IC from the number printed Give Pin out diagram Identify +ve and -ve Power supply pins Insert and remove the iC into and from the socket by observing starting (1) pin Make switch connections	▪ Identify digital IC from the number printed ▪ Identify +ve and -ve Power supply pins ▪ Insert and remove the iC into and from the socket by observing starting (1) pin
2	To Verify the truth tables of AND, OR,NOT, NAND, NOR Gates(3) 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	➢ Write the truth table for any Logic gate ➢ Apply correct Logic level Voltages ➢ Find out IC details from the datasheets ➢ Test the IC for its correct functionality by verifying the truth table ➢ Test the IC by feeling the heat by touching	▪ Apply correct Logic level Voltages ▪ Test the IC for its correct functionality by verifying the truth table ▪ Test the IC by feeling the heat by touching

	observations d) Verify the Truth table of 4073 IC		
3	To Realize AND , OR , NOT , functions using 2 input NAND and NOR TTL Gates(3) a) Implement Wire AND & Wire OR circuit and verify the truth table a) From the data sheets find out CMOS Equivalent of above ICs	➢ Substitute 2 input NAND or NOR gates to obtain the functionality of any logic gate with any number of inputs ➢ Use open collector logic gates with pull up resistor ➢ Read the data sheets	▪ Substitute 2 input NAND or NOR gates to obtain the functionality of any logic gate with any number of inputs ▪ Use open collector logic gates with pull up resistor
4	To Implement XOR Logic using 2 input Nand Gates and NOR Gates and verify the truth table(3)	➢ Realize simple Boolean functions using NAND &NOR gates ➢ Verify truth table by observing inputs and outputs	▪ Verify truth table by observing inputs and outputs ▪ Use XOR gate in simple logic circuits
5	a)To Implement the given logic function with 3 variables using 2 input CMOS NAND Gates only(3) b)Implement given logic function with 3 variables using 2 Input CMOS NOR Gates only.	➢ Realize simple Boolean functions using karanaugh maps method ➢ Applying correct logic voltages to CMOS ICs ➢ Follow precautions ➢ Read data sheets to check Fan-in and Fan-out	▪ Realize simple Boolean functions using karanaugh maps method ▪ .Applying correct logic voltages to CMOS ICs ▪ Follow precautions

		capacity	
6	To Implement Half adder and full adder circuits using TTL/CMOS gates and verify the truth tables.(3) b) Verify the truth table of BCD to 7 segment Decoder 7448 IC	➢ Realize simple Boolean functions using karanaugh maps method ➢ Design Half adder/Full adder circuit ➢ Use 7448 IC in the circuits	▪ Design Half adder/Full adder circuit ▪ Use 7448 IC in the circuits
7	To Verify the Truth table of 74138 Decoder IC(3) a) Verify the function of 74138 decoder IC. b) Combine two 3 to 8 decoder to realize a 4 to 16 Decoder	➢ Develop logic for Decoder Circuit ➢ Use 74138 in digital circuits ➢ Combine Decoder ICs to handle more bits	▪ Use 74138 in digital circuits ▪ Combine Decoder ICs to handle more bits
8	To Explore the Features of 74148 Encoder IC(3) a) Verify the function of 74148 Encoder b) Combine two 74148 Encoder	➢ Develop logic for Encoder Circuit ➢ Use 74148 in digital circuits ➢ Combine Decoder ICs to handle more bits	▪ Use 74148 in digital circuits ▪ Combine Encoder ICs to handle more bits
9	To Verify the Function of Multiplexer IC 74153(3) a) Verify the truth table of IC 74153 b) Combine two sections of 74153 Multiplexers ICs to realize 8:1 multiplexer	➢ Develop logic for Multiplexer ➢ Use 74153 in digital circuits ➢ Combine Multiplexer ICs to handle more bits	▪ Combine Multiplexer ICs to handle more bits ▪ Use Multiplxer ICs to realize given function

	c) Implement the given function using IC 74150 16:1 line multiplexer	➢ Use Multiplxer ICs to realize given function	
10	To Verify the Truth table and Functions of De multiplexers (a) Verify the truth table of IC 74154(3) b) Combine two sections of 74155 DeMultiplexers ICs to realize 1:8 Demultiplexer c) Implement the given function using IC 74154 16:1 line multiplexer	➢ Develop logic for DeMultiplexer ➢ Use 74154 in digital circuits ➢ Combine DeMultiplexer ICs ➢ Use DeMultiplxer ICs to realize given function	▪ Combine DeMultiplexer ICs Use DeMultiplxer ICs to realize given function
11.	To Verify the function of 4-bit magnitude comparator 7485IC.(3) 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	➢ Develop logic for magnitude comparator ➢ Verify the function of Magnitude comparator ➢ Use 7485IC in digital circuits	▪ Verify the function of Magnitude comparator ▪ Use 7485IC in digital circuits
12	To Construct and verify the truth tables of NAND & NOR latches(3) a) Implement Latch circuits with 7400 and 7402 Ics b) Realize a Bistable element with two NOT gates and a Feedback Resistor c) Implement a bounce Elimination switch using the above Gates c) Realize a clock circuit using 4093 CMOS Nand	➢ Develop logic for Latch circuits ➢ Use Not gates for Latch circuit applications ➢ Use latch circuits for de bouncing application ➢ Use Schmitt trigger NAND gate for clock circuits	▪ Use Not gates for Latch circuit applications ▪ Use latch circuits for de bouncing application ▪ Use Schmitt trigger NAND gate for clock circuits

	Gate , Resistor and capacitor and observe the waveform on CRO b) Interpret the specifications of 4093 IC from data sheets		
13	To Construct clocked RS FF using NAND gates and Verify its truth table.(3) 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	➢ Develop logic circuit for Clocked RS flip Flop using 7400 IC ➢ Verify the truth tables of CD4013 and 74L71 IC ➢ Use Preset and Clear Inputs ➢ Verify the Truth table of 7476 IC ➢ Modify 7476 to function as D flip Flop and T Flip Flop ➢ Use octal latch 74LS373	▪ Verify the truth tables of CD4013 and 74L71 IC ▪ Use Preset and Clear Inputs ▪ Verify the Truth table of 7476 IC ▪ Modify 7476 to function as D flip Flop and T Flip Flop ▪ Use octal latch 74LS373
14.	To Construct and verify the function of decade counter using 7490 ICs.(3) a) change the modulus of the counter b)Cascade two 7490 decade counter ICs to count up to 99 or any other modulus b) display decimal number using 7447 c) cascade two 7447 ICs to count up to 99	➢ .Develop logic for implementing Up/down counter ➢ Change the modulus of the counter ➢ Connect Counter IC 7447 IC to display the count ➢ Cascade Counter ICs	▪ Change the modulus of the counter ▪ Connect Counter IC 7447 IC to display the count ▪ Cascade Counter ICs

15	To Verify the function of up/down counter (3) a) Verify the truth table of 74190 a) change the modulus of the counter and verify b) Verify the Functionality of CD4029 up/down counter c) Load the Preset inputs of CD4029 Counter with a binary number	➢ Develop logic for implementing Up/down counter ➢ change the modulus of the counter ➢ Load the Preset inputs of CD4029	▪ Change the modulus of the counter ▪ Load the Preset inputs of CD4029
16	To Verify the function of shift register (3) a) Verify the truth table of 7495 b)Verify the truth table of 74194 Universal shift register in all modes	➢ Develop logic for implementing shift Registers ➢ Verify the truth table of 7495Ic in all modes ➢ Verify the truth table of 74194 Universal shift register in all modes	▪ Verify the truth table of 7495Ic in all modes ▪ Verify the truth table of 74194 Universal shift register in all modes
17.	To Verify the function of Johnson counter using CD 4017 IC(3) a) Change the modulus of the counter b) Design a Frequency divider circuit using 4017 IC c) Implement running LED circuit with 4017 IC	➢ Develop logic for implementing ➢ Verify the truth table of Johnson counter ➢ Set the modulus of counter to required value ➢ Use 4017 in frequency divider circuits and other digital circuits	▪ Set the modulus of counter to required value ▪ Use 4017 in frequency divider circuits and other digital circuits
18.	To Identify Various Memory ICs and Note their pin Configuration from the datasheets(3) a) RAM b) ROM c) EPROM d)EEPROM	➢ Identify memory chips from other Integrated circuits by observation and IC number	▪ Find out the memory capacity from the IC number ▪ .Identify different

		➢ Find out the memory capacity from the IC number ➢ Identify different memory chips	memory chips
19	Familiarization of usage of ORCAD /kiCad suite of tools for the design and layout of printed circuit boards (PCBs).(3)	➢ Use ORCAD suite/similar software and its features ➢ Select Components , ➢ Draw the circuit &simulate ➢ Debug the errors	▪ Select Components ▪ Draw the circuit & simulate ▪ Debug the errors
20	. Simulate a Full wave bridge rectifier with 7805 Regulator	➢ Use ORCAD suite/similar software and its features ➢ Select Components , ➢ Draw the circuit &simulate ➢ Debug the errors	▪ Select Components ▪ Draw the circuit & simulate ▪ Debug the errors
21	Simulate a single stage RC coupled transistor amplifier	➢ Use ORCAD suite/similar software and its features ➢ Select Components , ➢ Draw the circuit &simulate ➢ Debug the errors	▪ Select Components ▪ Draw the circuit & simulate ▪ Debug the errors
22	Simulate a 4 bit full adder /subtractor and test.(3)	➢ Develop logic for implementing 4 bit full adder /subtractor ➢ Select Components , ➢ Draw the circuit & simulate	▪ Select Components ▪ Draw the circuit & simulate ▪ Debug the errors

		➢ Debug the errors	
23	Design and simulate code converters using logic gates (3) (i) BCD to excess-3 code and vice versa (ii) Binary to gray and vice-versa	➢ Develop logic for implementing 4 bit full adder /subtractor ➢ Select Components , ➢ Draw the circuit & simulate ➢ Debug the errors	▪ Select Components ▪ Draw the circuit & simulate ▪ Debug the errors
24	Design and simulate 16 bit odd/even parity checker /generator using IC74180 (3)	➢ Develop logic for implementing 4 bit full adder /subtractor ➢ 2.Select Components , ➢ Draw the circuit & simulate ➢ Debug the errors	▪ Select Components ▪ Draw the circuit & simulate ▪ Debug the errors
25	Design and Simulate 4 bit ripple counter with Mod-10 and Mod-12 (3)	➢ Develop logic for implementing 4 bit full adder / subtractor ➢ Select Components ➢ Draw the circuit & simulate ➢ Debug the errors	▪ Select Components ▪ Draw the circuit & simulate ▪ Debug the errors

ANALOGUE COMMUNICATION LAB PRACTICE

Subject Title : Analogue Communication Lab Practice
Subject Code : EC-310
Periods/Week : 03
Periods/Semester : 45

Rationale:

Analogue communication lab is included to comprehend the concepts of Analogue communications , Network theorems and also to impart skills of using software tools

S. No.	Major Topics	No. of Periods
I.	Verification of Network theorems	6
II.	Electronic measuring equipment	3
III.	Measurements using CRO	12
IV.	Modulation , Demodulation Techniques &Antennas	6
V.	Pulse and wave shaping circuits	9
VI	Resonance & Filters	6
	Total	45

LIST OF EXPERIMENTS

I. Verification of Network theorems

1. a) Verify Thevenin's theorem.

B) Determine the Thevenin's Resistance of a Potential divider network

C) Verify Norton's theorem

2. A) Verify Super position theorem.

B) Verify Maximum power transfer theorem.

C) Connect Four 4 ohms speakers to obtain 4 Ohms Impedance and test for maximum power output by Audio amplifier at 4 ohms output terminals

II. Electronic measuring equipment

3. Measure the component values using special equipment

A) Use DMM/ Multimeter to measure DC current , AC Current ,Beta of transistor

B) Use the AC bridge/Digital LCR meter to measure Resistance , Inductance , Capacitance and Q

C) Measure the Distortion factor using Distortion Factor Meter.

III. Measurements using CRO

4. Familiarize with CRO front panel controls and observe the effect of different settings

A) Set intensity , Astigmatism and Focus controls to display i) Medium frequency ii) Low frequency iii) High frequency.

B) Apply different waveforms using function generator and produce flicker free waveforms

C) Set the output of function generator to desired amplitude and frequency (say 20 milli volts and 1.5 khz) by observing on CRO.

5. Determine Vertical and Horizontal deflection sensitivity of CRO by applying standard signal provided on CRO

A) Observe the effect of Trigger control on the waveform and display the waveform from the set point

B) Measure signal amplitude using x10 CRO probe.

6. Use dual mode for simultaneous observation of two signals .

A) Use ADD mode observe the resultant wave form

B) Measure the Time period and frequency of a signal in Time base multiplier mode

7. A) work with various controls on Digital CRO

B) Practice with i) Manual measurements ii) Cursor measurements iii) Automatic measurements By repeating sub experiments in experiment number 4& 5 .

C) Observe charging and discharging curves of a capacitor using digital CRO and determine time constant of given RC circuit

IV. Modulation & Demodulation Techniques &Antennas

8. A) implement and observe AM signal and determine Modulation index using CRO

I) Using Envelop method

Ii) Trapezoidal Pattern method

Iii) observe the effect of Over modulation and under modulation

B) Implement diode demodulator circuit and observe the detected waveform

9. Identify different sections in AM/FM radio receiver

B) Observe the different types of inductors used in the radio tuned circuits.(Local oscillator coils, IFT coils, Ferrite cored)

10. Generate FM signal and determine Modulation index

A) Demodulate F.M signal and compare the output signal with original modulating signal .

IV. Pulse and wave shaping circuits

11. A) Measure the Rise time, Fall time , duty cycle, Pulse width, Pulse amplitude , Overshoot of Pulse on CRO

B) observe the effect of Offset control on function generator on output waveform

12. A) Design and implement RC integrator circuit

B) apply a square wave and observe the output waveform on CRO.

C) use a differentiator circuit to convert a long Push button trigger signal into a pulse for use in Timer circuits

D) Use integrator circuit for producing triangular wave / Ramp

E) Design a Low pass filter Using Integrator circuit for a given cut off frequency

F) Design a High pass filter Using Differentiator circuit for a given cut off frequency

13. Realize Clipper and Clamper circuits and observe the waveforms on CRO

A) Realize Series and Parallel clippers

B)Assemble Positive and negative clipper circuits with and without bias

C) Connect a Zener diode in place of diode and measure the output voltage with DMM and also observe waveform on CRO

D) Realize a Clamper circuit and observe the input and output waveforms on CRO

V. Resonance &Filters

14. Plot resonant curves of a tuned circuit

A)Series Resonance., b)Parallel Resonance. C) Wind a small coil and determine its inductance

15. Design and construct constant K filters of 1st order

A) Design and implement a Low pass filter with a cut off frequency of 10 khz(or any other frequency) and evaluate the performance

B) Design and implement a High pass filter with a cut off frequency of 10 khz (or any other frequency) and evaluate the performance

Competencies & Key Competencies

Exp No	**Name of the Experiment (No of Periods)**	**Competencies**	**Key competencies**
1	a) To Verify Thevenin's theorem. (3) b) To Determine the Thevenin's Resistance of a Potential divider network c) To Verify Norton's theorem	➢ Assemble the circuit ➢ Observe the polarity of sources and meters ➢ Use voltmeter and ammeter correctly ➢ Choose correct Ranges ➢ Follow the sequence of procedure ➢ Verify theoretical & Practical results ➢ Troubleshoot any faults	▪ Select meters and components ▪ Open and short the ▪ Circuit terminals with care ▪ Use voltmeter and ammeter correctly

2	a) To Verify Super position theorem.(3) b) To Verify Maximum power transfer theorem. c) To Connect Four 4 ohms speakers to obtain 4 Ohms Impedance and test for maximum power output by Audio amplifier at 4 ohms output terminals	➢ Assemble the circuit ➢ Observe the polarity of sources and meters ➢ Use voltmeter and ammeter correctly ➢ Choose correct Ranges ➢ Troubleshoot any faults	▪ Use voltmeter and ammeter correctly ▪ Observe Polarity ▪ Find out correct series parallel combination to obtain desired impedance
3	To measure the component values using special equipment(3) a) Use DMM/ Multimeter to measure DC current , AC Current ,Beta of transistor b) To Use the AC bridge /Digital LCR meter to measure Resistance , Inductance , Capacitance and Q c) To measure the Distortion factor using Distortion Factor Meter.	➢ Identify the RLC bridge/Digital RLC meter and note the front panel controls. ➢ Measure component values by selecting the proper mode and range ➢ Use distortion factor meter for measure percentage of distortion ➢ Use AF power meter ➢ Use function Generator ➢ Use AC voltmeter in dB scale	▪ Identify RLC meters ▪ Use the RLC meter and Distortion factor meter ▪ Use AF power meter ▪ Use AC voltmeter in dB scale
4	To familiarize with CRO front panel controls and observe the effect of different settings(3) a)To set intensity , Astigmatism and Focus controls to display i) Medium frequency ii) Low	➢ Use Function Generator ➢ Use various controls and select appropriate ranges on Analogue CRO ➢ Connect BNC Probe ➢ Test the BNC Cable	▪ Use Function generator ▪ Use CRO controls and selecting Correct Ranges ▪ Produce flicker free

	frequency iii) High frequency. b) To apply different waveforms using function generator and produce flicker free waveforms c) To set the output of function generator to desired amplitude and frequency (say 20 milli volts and 1.5 KHz) by observing on CRO.	before applying the signal ➢ Observe Positive and Negative peaks of a wave form.	waveform and measure the amplitude , Time period and frequency of signal
5	To determine Vertical and Horizontal deflection sensitivity of CRO by applying standard signal provided on CRO (3) a) To observe the effect of Trigger control on the waveform and display the waveform from the set point b) To measure signal amplitude using x10 CRO probe.	➢ Apply standard signal & calibrate ➢ Display the waveform from set point using Trigger control ➢ Determine Vertical and Horizontal deflection sensitivities and carryout accurate measurements ➢ Measure the amplitude and frequencies of small and high level signals using CRO Probes	▪ Apply standard signal & calibrate ▪ Display the waveform from set point using Trigger control ▪ Determine Vertical and Horizontal deflection sensitivities and carryout accurate measurements
6	To use dual mode for simultaneous observation of two signals (3) a) To use ADD &INVERT modes observe the resultant wave form b) To use XY mode to measure	➢ Select XY mode in CRO ➢ Apply signals to correct channels ➢ Measure phase angle by lissajous pattern method and interpret them ➢ Compare frequencies by	▪ Select XY Mode in CRO ▪ Measure phase angles by Lissajous pattern method ▪ Compare frequencies by

	phase angle and compare frequencies using Lissajous patterns method	Lissajous pattern method	interpret Lissajous pattern
7	a) To work with various controls on Digital CRO (3) b) To practice with i) Manual measurements ii) Cursor measurements iii) Automatic measurements by repeating sub experiments in experiment number4& 5. c) To observe charging and discharging curves of a capacitor using digital CRO and determine time constant of given RC circuit	➢ Use Controls on Digital CRO ➢ Use different modes of measurement ➢ Use storage function of Digital CRO to capture transient characteristics	▪ Use Controls on Digital CRO ▪ Use different modes of measurement ▪ Use storage function of Digital CRO to capture transient characteristics
8	To implement and observe AM signal and determine Modulation index using CRO(3) i) Using Envelop method ii) Trapezoidal Pattern method iii) To observe the effect of Over modulation and under modulation b) To implement diode demodulator circuit and observe the detected waveform	➢ implement AM Circuit and Test ➢ Identify maxima and minima on the displayed waveform ➢ Overmodulate and under modulate the AM signal ➢ Use CRO in XY mode to determine modulation index ➢ Identify diode demodulator circuit components	▪ Perform the Experiment as per procedure and calculate modulation index. ▪ Identify maxima and minima on the displayed waveform ▪ Use CRO in XY mode to determine modulation index

9	Identify different sections in AM/FM radio receiver a) identify the different types of inductors used in the radio tuned circuits.(Local oscillator coils, IFT coils, Ferrite core(3)	➢ Note down the Radio frequency Bands by observe the Dial. ➢ Identify the tuned circuits corresponding to different bands ➢ Observe Band selection switch connections in AM receiver ➢ Identify different sections in Radio receiver . ➢ Measure the Voltages at Test points with multimeter	▪ Identify different sections n Radio receiver and measure the signal at test points
10	a)To generate FM signal and determine Modulation index b)To Demodulate F.M signal and compare the output signal with original modulating signal (3)	➢ Observe the FM signal on CRO ➢ Measure the amplitude and frequencies of carrier and Modulating Signal ➢ Measure the Frequency Deviation ➢ Identify FM Detector circuit and note down the IC numbers ➢ Identify the amplitude limiter section on FM detector	▪ Identify FM signal, on CRO ▪ Measure the amplitude &Frequency of baseband & Carrier on CRO ▪ Measure frequency deviation
11	To Measure the Rise time, Fall time , duty cycle, Pulse width, Pulse amplitude , Overshoot of	➢ Identify the Pulse waveform ➢ Measure pulse	▪ Identify the Pulse waveform ▪ Measure pulse

	Pulse on CRO(3) b)To observe the effect of Offset control on function generator on output waveform	parameters using CRO by selecting correct Timebase and Volts/Div	parameters using CRO by selecting correct Timebase and Volts/Div
12	To Design and implement RC integrator/Differentiator circuit (3) a) To apply a square wave and observe the output waveform on CRO. b) To use a differentiator circuit to convert a long Push button trigger signal into a pulse for use in Timer circuits c) To Use integrator circuit for producing triangular wave / Ramp d) To Design a Low pass RC filter Using Integrator circuit for a given cut off frequency e) To Design a High pass RC filter Using Differentiator circuit for a given cut off frequency	➢ Identify Passive Differentiator and integrator circuits. ➢ Choose correct values for components ➢ Vary the Time constant ➢ Use the Differentiator and integrator circuits for wave shaping applications	▪ Choose correct values for components ▪ Rig up the circuit ▪ Observe input /Output waveforms on CRO
13	To Realize Clipper and Clamper circuits and observe the waveforms on CRO(3) a)To Realize Series and Parallel clippers b) To Assemble Positive and negative clipper circuits with and without bias	➢ Choose correct values for components ➢ Rig up the circuit ➢ Observe & Measure Input/Output waveforms ➢ Vary the Time constant ➢ Use clipper and Power clamper circuits for	▪ Rig up the circuit ▪ Observe & Measure Input/Output waveforms ▪ Vary the Time constant

	c) To Connect a Zener diode in place of diode and measure the output voltage with DMM and also observe waveform on CRO d) To Realize a Clamper circuit and observe the input and output waveforms on CRO	protection	
14	To plot resonant curves of a tuned circuit (3) a)Series Resonance., b)Parallel Resonance. c) To observe the effect of change in RLC Values	➢ To identify the TUNED circuit components ➢ connect L and C to form a series and parallel resonant circuit ➢ Identify the resonant frequency by observing waveform peak on CRO ➢ Determine theoretical Resonant frequency	▪ Identify tank circuit components ▪ Identify the resonant frequency by observing waveform peak on CRO
15	Design and construct constant K filters of 1st order (3) A) Design and implement a Low pass filter with a cut off frequency of 10 KHz(or any other frequency) and evaluate the performance B) Design and implement a High pass filter with a cut off frequency of 10 KHz(or any other frequency) and evaluate the performance	➢ Identify the Filter circuit components ➢ Design the Low pass & high pass Filter for a given cut off frequency ➢ Observe and locate 3db points on the response curve	▪ Design the Low pass & high pass Filter for a given cut off frequency

IV SEMESTER

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING

C-16 SCHEME OF INSTITUTIONS AND EXAMINATIONS

IV SEMESTER

Subject Code	Name of the subject	Institution periods/week		Total periods/year	Scheme of Examination			
		Theory	Practical		Duration(Hours)	Sessional marks	End exam marks	Total marks
THEORY SUBJECTS								
EC-401	Mathematics -IV	4		60	3	20	80	100
EC-402	Linear Integrated circuits	6		90	3	20	80	100
EC-403	Advanced Communication systems	5		75	3	20	80	100
EC-404	Digital Communication	5		75	3	20	80	100
EC-405	Microcontroller Programming	5		75	3	20	80	100
EC-406	Programming in C	5		75	3	20	80	100
PRACTICAL SUBJECTS								
EC-407	Linear Integrated circuits Lab Practice		3	45	3	40	60	100
EC-408	Digital Communication Lab Practice		3	45	3	40	60	100
EC-409	Microcontroller Programming Lab Practice		3	45	3	40	60	100
EC-410	Programming in C lab Practice		3	45	3	40	60	100
	Total	30	12	630		280	720	1000

Engineering Mathematics – IV

(Common to all branches)

Subject Title : Engineering Mathematics – IV
Subject code : EC-401
Periods/Week : 04
Periods/semester : 60

Blue Print

S. No	Major Topic	No of Periods	Weightage of	Short Type			Essay Type		
	Unit -I Differential Equations			**R**	**U**	**App**	**R**	**U**	**App**
1	Homogenous Linear Differential equations with constant coefficients	5	6	2	0	0	0	0	0
2	Non-homogenous Linear Differential equations with constant coefficients	10	23	0	1	0	1	1	0
	Unit – II								
3	Laplace Transforms	20	32	1	2	1	1	0	1
	Unit – III								
4	Fourier Series	13	26	1	1	0	0	1	1
	Unit – IV								
5	Probability	12	23	1			1/2	1/2	1
	Total	60	110	5	4	1	2 1/2	2 1/2	3
			Marks:	15	12	3	25	25	30

R: Remembering type 40 marks

U: Understanding typ 37 marks

33 marks

App: Application type

ENGINEERING MATHEMATICS – III(Common to All Branches)

Objectives

Upon completion of the course the student should be able to

Unit-I-Differential Equations

1.0 Solve Homogeneous linear differential equations with constant coefficients in engineering situations

1.1 Solve Differential equations of the type $(aD^2 + bD + c)y = 0$ when the roots of the auxiliary equation are real and different, real and repeated, complex.

1.2 Solve the higher order homogeneous differential equations with constant coefficients.

2.0 Solve Non Homogeneous linear differential equations with constant coefficients in engineering situations

2.1 Explain the concept of complementary function, particular Integral and general solution of a differential equation.

2.2 Solve n^{th} order differential equation of the type $f(D)\ y = X$ where $f(D)$ is a polynomial of nth order and X is a function of the form $k, e^{ax}, Sinax, Cosax, x^n$.

Unit-II- Laplace Transforms

3.0 Use Laplace Transforms to solve differential equation in engineering problems

3.1 Write the definition of Laplace Transform and Laplace transform of standard functions.

3.2 Explain the sufficient conditions of existence of Laplace Transform.

3.3 Write the properties of Laplace Transform – Linear property, First shifting property, Change of Scale.

3.4 Solve simple problems using the above properties

3.5 Write formulae for Laplace transform of $t^n f(t)$, $\frac{f(t)}{t}$, $f^{(n)}(t)$, $\int_0^t f(u)\,du$ interms of Laplace transform of $f(t)$.

3.6 Solve simple problems using the above formulae.

3.7 Define unit step function and write the Laplace Transform of unit step function.

3.8 Write second shifting property.

3.9 Define inverse Laplace Transform and write inverse Laplace Transform of standard functions.

3.10 Solve simple problems on 3.9

3.11 Write first shifting property of inverse Laplace Transfrom.

3.12 Solve simple problems on 3.11

3.13 Write inverse Laplace Transforms corresponding to Laplace Transform of the functions mentioned in section 3.5

3.14 Solve simple problems on 3.13.

3.15 Define convolution of two functions and state convolution theorem.

3.16 Solve simple problems on 3.15.

3.17 Use Laplace and inverse Laplace Transforms to solve simple differential equations of second order.

Unit-III- Fourier Series

4.0 Know Fourier Series expansion of functions

4.1 Define the orthogonality of functions in an interval.

4.2 Define Fourier series of a function on the interval $(c,\ c+2\pi)$ and write the Euler's formulae for determining the Fourier coefficients.

4.3 Write sufficient conditions for the existence of Fourier series for a function.

4.4 Find Fourier series of simple functions in the range $(0, 2\pi)$, $(-\pi,\ \pi)$.

4.5 Write Fourier series for even and odd functions in the interval $(-\pi,\ \pi)$.

4.6 Write Fourier series expansion of a function over the interval $(-l,\ l)$

4.7 Write half range Fourier sine and cosine series of a function over the interval $(0,\ l)$

4.8 Solve simple problems on 4.5, 4.6 and 4.7

Unit-IV- Probability

5.0 Understand the basic concepts of

5.1 Recall sets, operations on sets and Venn-diagrams.

5.2 Explain the terminology – random experiment, outcome, sample space, elementary event and event.

5.3 Define Probability – Empirical approach and axiomatic approach (Mathematical).

5.4 Prove addition theorem of probability for two mutually exclusive and exhaustive events.

5.5 State addition theorem of probability for three mutually exclusive and exhaustive events.

5.6 Solve simple problems on addition theorem.

5.7 Explain dependent, independent events and conditional event.

5.8 State the formula for conditional probability.

5.9 State multiplication theorem of probability.

5.10 State Bayes' theorem.

5.11 Solve simple problems on conditional probability and Bayes' theorem.

COURSE CONTENT

1.0 Differential Equations

1.Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.

2.Non-homogenous linear differential equations with constant coefficients of the form f(D)y = X

where X is in the form k, e^{ax}, sin ax, cos ax, x^n, (n= 1,2) – complimentary function, particular integral and general solution.

3.0 Laplace Transforms(LT)

Definition, sufficient conditions for existence of LT, LT of elementary functions, linearity property, scale change property, first shifting property, multiplication by t^n, division by t, LT of derivatives and integrals, unit step function, LT of unit step function, second shifting theorem, inverse Laplace transforms- shifting theorems and change of scale property, multiplication by s^n and division by s – examples of inverse LT using partial fractions – convolution theorem (no proof) – applications of LT to solve ordinary differential equations with initial conditions (2^{nd} order only)

4.0 Fourier Series

Orthogonality of trigonometric functions, Representation of a function in Fourier series over the interval $(c\ ,\ c+2\pi)$, Euler's formulae , sufficient conditions for existence of Fourier series for a function, even, odd functions and their Fourier series over the interval $(0,\ 2\pi)$, Change of length of interval – Fourier series , half range series.

5.0 Probability

Review of sets, operations on sets and Venn-diagrams; random experiment, outcome, sample space, elementary event and event, equally likely events, Definition of Probability –

Empirical approach and axiomatic approach (Mathematical), addition theorem of probability for two mutually exclusive and exhaustive events, extension of addition theorem for three mutually exclusive and exhaustive events, dependent, independent events and conditional event, probability of a conditional event, multiplication theorem, Bayes' theorem.

REFERENCE BOOKS :

1. Higher Engineering Mathematics, B.V.Ramana, Tata McGraw-Hill
2. Probability, 2/e Schaum's Outlines Series, McGraw-Hill
3. Elementary Probability and Statistics, by S.C.Gupta and V.K.Kapoor

LINEAR INTEGRATED CIRCUITS

Subject Title : Linear Integrated Circuits
Subject Code : EC- 402
Periods/Week : 05
Periods/Semester : 90

Rationale ; Linear integrated circuits is a core subjects which gives a clear insight in to the Use of operational amplifiers and other integrated circuits in Industrial applications . Emphasis is laid on fundamental concepts and practical applications

TIME SCHEDULE

Sl	Major Topics	Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1	IC Manufacturing	08	13	1	1
2	Operational Amplifier	14	16	2	1
3	Op-Amp Applications	18	26	2	2
4	Non Linear Wave Shaping Circuits, Timers and PLL	24	29	3	2
5	Instrumentation amplifiers, A/D & D/A Converters	16	26	2	2
		90	**110**	**10**	**8**

OBJECTIVE:

Upon completion of the course the student should be able to

1.0 Explain the IC Manufacturing methods

1.1 List the merits and demerits of **Integrated Circuits** over discrete assembly.

1.2 Classify ICs based on fabrication techniques (monolithic, thin film, thick film and hybrid).

1.3 Compare the different types of above fabrication techniques.

1.4 Explain the manufacturing process of monolithic ICs.

1.5 Explain the fabrication of resistor, and capacitor on monolithic IC.

1.6 Explain the fabrication of diode and transistor on monolithic IC.

1.7 List different IC packages.

1.8 Draw the sketch of above package types

1.9 Mention the power rating of above packages.

1.10 Explain various levels of integration (SSI, MSI, LSI, VLSI etc.,).

1.11 Explain the Surface Mount Technology (SMT)

1.12 List 6 merits of SMT Technology.

2.0 Understand the working of Operational amplifiers.

2.1 State the need for differential amplifier

2.2 Draw and explain the circuit diagram of differential amplifier

2.3 Give reasons for not implementing differential amplifier with discrete components.

2.4 Define the terms differential gain and common mode gain

2.5 State the function of an operational amplifier.

2.6 Draw the symbol of an operational amplifier.

2.7 Explain inverting and Non inverting inputs of Op Amp

2.8 State the important characteristics of ideal operational amplifier with practical values.

2.9 Define Input impedance, Open loop gain, Slew rate, CMRR, Input offset voltage, Input offset Current,

2.10 Draw the Pin configuration of IC 741

2.11 State the function of Each pin.

2.12 Give typical values of Open loop gain, Slew rate, CMRR, Input offset voltage, Input offset Current,

2.13 Explain the power supply requirements of Operational Amplifier.

2.14 Explain the Inverting amplifier configuration of Op Amp with input and output waveforms.

2.15 Derive the equation for voltage gain of an inverting amplifier

2.16 Explain the concept of virtual ground and Virtual short.

2.17 Derive the equation for voltage gain of an inverting amplifier.

2.18 Explain the Non Inverting amplifier configuration of Op Amp.

2.19 Derive the formula for Voltage gain of above.

2.20 Explain the use of operational amplifier as i) inverter , ii) Buffer iii) Summing Amplifier iv)Scale changer v) Integrator vi) Differentiator

2.21 Mention the reasons for not implementing differentiator circuit in high frequency applications.

2.22 Explain single supply operation of Operational Amplifier.

2.23 Give the pin configuration of single supply Op Amps such as CA 3011 ,LM324

2.24 List 6 important features of above ICs

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3.0. **Understand Operational Amplifier applications**

3.1. Explain Wein-bridge Sine wave Oscillator circuit using an OP-Amp

3.2. Mention the reason for using non linear element in the feedback circuit.

3.3. State the conditions required for stable operation and frequency of oscillation of above circuit

3.4. Explain RC Phase shift oscillator circuit using OP Amp

3.5. Mention the conditions and frequency of oscillation for stable operation of the above circuit

3.6. Explain Gain Bandwidth product of OpAmp

3.7. Distinguish between Active and Passive filters.

3.8. Explain the working of Op amp Active low pass filter with circuit diagram of first order.

3.9. Draw the frequency response of the above circuit.

3.10. Explain the working of Op amp Active high pass filter with circuit diagram of first order

3.11. Draw the frequency response of the above circuit.

3.12. Mention the merits of active filters.

3.13. Explain the operation of transistor series and shunt type regulators.

3.14. Classify the types of IC regulators.

3.15. Explain the operation of fixed positive voltage regulator with a block diagram.

3.16. Give the formula for output voltage.

3.17. Mention the numbering convention used for fixed regulators to describe the output voltage.

3.18. Draw the pin out diagram of 78XX and 79XX type regulators.

3.19. Draw the circuit of 78XX fixed positive voltage regulator

3.20. Explain the working of above circuit.

3.21. Draw the circuit of dual power supply using 78XX and79XX type regulators.

3.22. Explain the operation of adjustable voltage regulator (LM317).

3.23. Give the formula for output voltage of adjustable regulators

3.24. Mention thermal shut down protection in the above regulators.

4.0. **Understand Non Linear Wave Shaping Circuits, Timers and PLL**

4.1. List the different types of clippers.

4.2. Explain the unbiased and biased clippers with waveforms

4.3. Explain the double ended clipper with waveforms

4.4. Explain the principle of clamper circuit with waveforms

4.5. Mention the applications of clippers and clampers

4.6. Define Sweep Voltage.

4.7. State the fundamental consideration of sweep waveform.

4.8. Distinguish between voltage and current time-base generation

4.9. List 3 applications of Voltage and current Time base circuits.

4.10. Draw the Bootstrap sweep circuit.

4.11. Explain Bootstrap sweep circuit.

4.12. Draw Miller's sweep circuit using op Amp.

4.13. Explain Miller's sweep circuit using op Amp.

4.14. Classify Multi vibrators.

4.15. Draw and explain the operation of transistor astable multivibrator.

4.16. Draw OP-Amp Bistable multi vibrator

4.17. Explain the working of OP-Amp Bistable multi vibrator with output waveforms.

4.18. Draw and explain the working of OP-Amp Monostable multivibrator with waveforms.

4.19. Draw the circuit of Astable multi vibrator using OP-Amp.

4.20. Explain the working of OP-Amp based Astable multi vibrator with output waveforms.

4.21. List 6 applications of multivibrators

4.22. Draw OP-Amp Schmitt trigger circuit.

4.23. Explain the working of OP-Amp Schmitt trigger circuit.

4.24. Draw the block diagram of 555 IC and explain.

4.25. Explain the working of astable multi using 555 IC.

4.26. Explain the working of Monostable Multivibrator using 555 IC.

4.27. Explain the concept of Phase locked loops
4.28. Draw and explain the block diagram of PLL – LM565.
4.29. Explain the operation VCO (LM566)
4.30. Define lock range of PLL
4.31. Define capture range of PLL.
4.32. Give design rules(Formulas) for implementing PLL circuit
4.33. List the applications of PLL.
4.34. Explain use of PLL as frequency multiplier

5.0. **Understand Instrumentation amplifiers, A/D and D/Converters.**

5.1. Explain the use of op amp circuits in instrumentation.
5.2. Distinguish between Op amp and instrumentation amplifier.
5.3. Explain the need for instrumentation amplifier
5.4. Draw three OP amp instrumentation amplifier circuit
5.5. Explain the working of above circuits.
5.6. Draw the *Voltage to current* converter circuit.
5.7. Explain the operation of above circuit
5.8. List 3 applications of *Voltage to current* converter.
5.9. Draw the *Current to Voltage* converter circuit.
5.10. Explain the operation of *Current to Voltage* converter circuit.
5.11. List 3 applications of *Current to Voltage* converter.
5.12. State the need for *A/D* and *D/A* conversion.
5.13. Define the terms resolution, Accuracy, Monotonicity and settling time of D/A converter.
5.14. Draw and explain the circuit of D/A converter using binary weighted resistors
5.15. Explain the operation D/A converter using binary weighted resistors.
5.16. Draw and explain the circuit of D/A converter using R-2R ladder network.
5.17. Explain operation of D/A converter using R-2R ladder network.
5.18. Explain the operation of A/D converter using counter method with a block diagram
5.19. Explain A/D converter using successive approximation method with a block diagram
5.20. Compare the performance of above A/D converters

COURSE CONTENT

1.0 IC Manufacturing methods

Merits and demerits of Integrated Circuits-Classification of ICs based on manufacturing process (monolithic, thin film, thick film and hybrid)- Manufacturing process of monolithic ICs-

fabrication of resistor, and capacitor on monolithic IC- Fabrication of diode and transistor on monolithic IC- different IC packages- - Power rating of above packages- Various levels of integration (SSI, MSI, LSI, VLSI etc.,)- Surface Mount Technology (SMT)- Merits of SMT Technology-

2.0 Operational amplifiers.

Need for differential amplifier- Circuit diagram of differential amplifier- Operation of differential amplifier- Reasons for not implementing differential amplifier with discrete components- differential gain and common mode gain- Function of an operational amplifier- Symbol - Inverting and Non inverting inputs of Op Amp- Important characteristics of ideal operational amplifier- Input impedance, Open loop gain, Slew rate, CMRR, Input offset voltage, Input offset Current- block diagram and pin out diagram of IC 741 - Pin configuration of IC 741- Typical values of Open loop gain, Slew rate, CMRR, Input offset voltage, Input offset Current- Power supply requirements of Operational Amplifier- Inverting amplifier configuration of Op Amp- input and output waveforms- Concept of virtual ground and Virtual short- Equation for voltage gain- Effect of feedback on input impedance and Bandwidth for inverting amplifier configuration- Non Inverting amplifier configuration of Op Amp- formula for Voltage gain- Effect of feedback on input impedance and Bandwidth- For Non inverting amplifier configuration.

Use of operational amplifier as i) inverter , ii) Buffer iii) Summing Amplifier iv)Scale changer v) Integrator vi) Differentiator- Reasons for not implementing differentiator circuit in high frequency applications- Single supply operation of Operational Amplifier- Pin configuration of single supply Op Amps such as CA 3011 ,LM324 - Features of above ICs.

3.0 Understand Operational Amplifier applications

OP-Amp Wein-bridge Oscillator circuit- - Output waveform - Conditions required for stable operation - RC Phase shift oscillator using OP Amp - conditions for stable operation - Gain Bandwidth product of OpAmp- Active and Passive filters- Op amp Active low pass filter with circuit diagram of first order- Frequency response - Op amp Active high pass filter of first order- Frequency response of the above circuit- Merits of active filters- types of IC regulators- Operation of fixed positive voltage regulator - Formula for output voltage-Mention the numbering convention used for fixed regulators to describe the output voltage- Pin out diagram of 78XX and 79XX type regulators- Circuit of 78XX fixed positive voltage regulator- Working of circuit of dual power supply using 78XX and79XX type regulators- Operation of adjustable voltage

regulator (LM317)- Formula for output voltage- Thermal shut down protection in the above regulators

4.0 Non Linear Wave Shaping Circuits, Timers and PLL

Different types of clippers- Unbiased and biased clippers with waveforms-Double ended clipper with waveforms- Principle of clamper circuit with waveforms- Applications of clippers and clampers- Sweep Voltage- voltage and current time-base generation- Applications of Voltage and current Time base circuits- Bootstrap sweep circuit- Miller's sweep circuit using op Amp- Classification of Multi vibrators- OP-Amp Bistable multi vibrator - OP-Amp Bistable multi vibrator- output waveforms- OP-Amp Monostable multivibrator with waveforms- Astable multi vibrator using OP-Amp- OP-Amp based Astable multi vibrator- waveforms- applications of multivibrators- OP-Amp Schmitt trigger circuit- fundamental consideration of sweep waveform- Hysteresis of Schmitt trigger circuit- block diagram of 555 IC - Astable multi using 555 IC- Monostable Multivibrator using 555 IC.- Phase locked loops - Block diagram of PLL – LM565- operation of VCO (LM566)- Lock range of PLL- Capture range of PLL-Give design rules(Formulas) for implementing PLL circuit - Applications of PLL- Frequency multiplier

5.0 Instrumentation amplifiers, A/D and D/A Converters.

Use of op amp circuits in instrumentation- Op amp and instrumentation amplifier- Need for instrumentation amplifier- OP amp instrumentation amplifier circuit- *Voltage to current* converter circuit- applications of *Voltage to current* converter- *Current to Voltage* converter circuit - *Current to Voltage* converter circuit - Applications of *Current to Voltage* converter- Need for *A/D* and *D/A* conversion- terms resolution, Accuracy, Monotonicity and settling time of D/A converter- D/A converter using binary weighted resistors- D/A converter using binary weighted resistors- Circuit of D/A converter using R-2R ladder network- D/A converter using R-2R ladder network.

A/D converter using counter method with a block diagram - A/D converter using successive approximation method - Block diagram - Performance of above A/D converters

REFERENCE BOOKS:

1. Electronic Devices and Circuits – T.F. Bogart Jr., J.S.Beasley and G.Rico, Pearson Education,6th edition, 2004.
2. Operational Amplifiers and Linear Integrated circuits"- Ramakant .A Gayakwad – Prentice Hall – 2000.
3. Linear Integrated circuits – D.Roy choudhury & Shail.B. Jain – New age International Publishers – II Edition – 2004.

ADVANCED COMMUNICATION SYSTEMS

Subject Title : Advanced Communication Systems
Subject Code : EC-403
Periods/Week : 05
Periods/Semester : 75

Rationale: Advanced Communication systems subject is a core subject aimed to impart sufficient theoretical inputs in Transmission lines Microwave devices, Radars, and satellite communication to keep in pace with the fast changing technology.

TIME SCHEDULE

Sl	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Transmission Lines	15	16	2	1
2	Microwave components and Tubes	15	26	2	2
3	Microwave semiconductor devices and MICs	15	16	2	1
4	RADAR	15	26	2	2
5	Satellite Communication	15	26	2	2
	Total	75	110	10	8

OBJECTIVES

Upon completion of the course the student should be able to

Understand the working of Transmission Lines

1.1 List the difference between energy propagation at extremely low frequency and at extremely high frequency

1.2 List different types of Transmission Lines.

1.3 Draw the Electrical equivalent circuit of a Transmission line.

1.4 Define Primary and Secondary constants of a Transmission line.

1.5 Derive the transmission line equations with respect to sending end and receiving end voltages

1.6 Derive the expressions for attenuation and phase constants

1.7 Define group and phase velocities in transmission lines

1.8 Define lossless Line and infinite line

1.9 List two types of distortions in transmission lines

1.10 Derive the condition for distortion less line

1.11 Define Reflection coefficient and SWR

1.12 Derive the relation between Reflection Coefficient & SWR

1.13 Derive the equation for input impedance of a transmission line terminated with load Z_L

1.14 Give Expressions for input impedance of a transmission line when its lengths are λ/4, λ/2, λ

1.15 Explain the need for impedance matching in transmission lines.

1.16 Explain Impedance Matching using quarter wave transmission line.

2.0 Microwave Components and Tubes

2.1 State the need for microwave devices.

2.2 List the various bands in microwave frequency range.

2.3 Define rectangular and circular waveguides.

2.4 Explain various modes of operation of waveguides.

2.5 Define dominant mode and cut-off wavelength in rectangular waveguide.

2.6 Calculate the cut-off frequency, cut-off wavelength, guide wavelength, phase velocity, group velocity and characteristic impedance in rectangular waveguide.

2.7 State the need for microwave bends, corners and twists

2.8 List different T-Junctions

2.9 Explain the working of E-Plane Tee and H-Plane Tee.

2.10 Explain the working of Magic Tee

2.11 Mention faraday rotation in ferrites

2.12 State the need for isolators and circulators

2.13 Explain the working of Isolator

2.14 Explain the working of Circulator.

2.15 Explain the working of Multi cavity Klystron amplifier.

2.16 List the applications of Multi cavity Klystron

2.17 Explain the working of Reflex Klystron oscillator

2.18 List the applications of Reflex Klystron.

2.19 Explain the construction and working of Magnetron oscillator

2.20 List the applications of Magnetron.

2.21 Explain the construction and working of Travelling Wave Tube amplifier

2.22 List the applications of TWTA.

3.0 Microwave Semiconductor Devices and MICs

3.1 State the need for microwave semiconductor devices

3.2 Distinguish between ordinary semiconductor devices and microwave semiconductor devices.

3.3 Define Gunn Effect.

3.4 Explain constructional features and working principle of GUNN diode

3.5 List the applications of GUNN diode.

3.6 State the Tunnelling phenomena

3.7 Explain the V-I characteristics of tunnel diode

3.8 List the other semiconductor microwave devices like IMPATT and TRAPPAT diodes

3.9 List the applications of IMPATT & TRAPATT diodes

3.10 List the advantages of microwave semiconductor devices over electron beam devices.

3.11 State the need for Microwave Integrated Circuits (MICs)

3.12 Explain the construction of microstrip antenna

3.13 Explain the working of micro-strip antenna

3.14 List the applications of micro-strip antennas.

4.0 Understand the principles of RADAR

4.1 State the basic principle of Radar with a block diagram.

4.2 Derive the basic Radar range equation.

4.3 Predict the range performance factors from range equation.

4.4 Draw and explain the block diagram of pulsed Radar system.

4.5 State the need for duplexer in Radar

4.6 Explain the working of branch type Duplexer with sketch.

4.7 List the types of indicators used in radar systems.

4.8 Briefly explain A-scope,. B-scope and PPI displays.

4.9 State the disadvantages of pulsed radar.

4.10 Explain the Doppler Effect.

4.11 Explain the principle of CW radar

4.12 Draw and explain the block diagram of CW radar.

4.13 List the limitations of a CW Radar

4.14 Explain the working of FM CW Radar.

4.15 Explain the application of FM CW Radar as altimeter

4.16 Draw and explain the block diagram of MTI Radar.

4.17 List the applications of various Radar systems.

4.18 Explain the principle of instrument landing system.

5.0 Understand the principle of working of satellite communication

5.1 Mention the frequency bands used in satellite and microwave communication links

5.2 State the need for satellite communication

5.3 Define foot print of a satellite

5.4 Mention the uses of microwave links.

5.5 Explain fixed microwave link with block diagram.

5.6 Classify satellites

5.7 Derive the expression for velocity of a satellite in an orbit

5.8 List the advantages of satellite communication over terrestrial radio communication.

5.9 Explain features of satellites in LEO,MEO,GEO

5.10 List the applications of satellites in above orbits

5.11 List the advantages and disadvantages geostationary satellites.

5.12 Define azimuth and elevation with reference to satellites.

5.13 Define terms apogee and perigee.

5.14 Define uplink frequency and down link frequency

5.15 List the functions of a transponder

5.16 List three types transponders used in satellites (single conversion, double conversion and regenerative)

5.17 Explain the working of the three types of transponders.

5.18 Explain bandwidth allocation of a satellite.

5.19 List the three methods of increasing satellite capacity

5.20 Draw and explain the block diagram of communication satellite.

5.21 Draw and explain the block diagram of Earth station.

5.22 Explain the working principle of GPS

5.23 Mention 3 applications of GPS

5.24 List the applications of satellites.

5.25 List the factors affecting satellite communication

COURSE CONTENT

1. **Transmission Lines:**

Types of Transmission Lines- Electrical equivalent circuit of a Transmission line- Primary and Secondary constants of a Transmission line-Transmission line equations-Expressions for attenuation and phase constants-Group and phase velocities in transmission lines-Concept of Infinite Line-Lossless Line-Types of distortions in transmission lines-Condition for distortion less line- Reflection coefficient and SWR-Relation between Reflection Coefficient & SWR-Need for impedance matching in transmission lines-Impedance Matching using quarter wave transmission line- Give Expressions for input impedance of a transmission line when its lengths are λ/4, λ/2, λ- need for impedance matching in transmission lines.-Impedance Matching using quarter wave transmission line.

2. Microwave components and Tubes:

Need for microwave devices-Various bands in microwave frequency range-Rectangular and circular waveguides- Various modes of operation of waveguides-Dominant mode and cut-off wavelength in rectangular waveguide-Calculation of cut-off frequency, cut-off wavelength, guide wavelength, phase velocity, group velocity and characteristic impedance in rectangular waveguide-Need for microwave bends, corners and twists- T-Junctions-Working of E-Plane Tee and H-Plane Tee- Working of Magic Tee-Need for isolators and circulators- Working of Isolator-Working of Circulator-Construction and working of Multi cavity Klystron amplifier- Applications of Multi cavity Klystron-Cavity resonator- Construction and working of Reflex Klystron oscillator-Applications of Reflex Klystron- Construction and working of Magnetron oscillator- Applications of Magnetron- Construction and working of Travelling Wave Tube amplifier- Applications of TWTA.

3. **Microwave Semiconductor Devices and MICs:**

Need for microwave semiconductor devices-Ordinary semiconductor devices and microwave semiconductor devices-Gunn Effect-Explain constructional features and working principle of GUNN diode-Applications of GUNN diode- Tunnelling phenomena-Working of Tunnel diode-

Other semiconductor microwave devices like IMPATT and TRAPPAT diodes-Applications of IMPATT & TRAPATT diodes-Advantages of microwave semiconductor devices over electron beam devices-Need for Microwave Integrated Circuits (MICs)-Working of micro-strip antenna-Construction-Applications of micro-strip antennas.

4. Principles of RADAR:

Basic principle of Radar with a block diagram-Basic Radar range equation-Range performance factors from range equation-Block diagram of pulsed Radar system-Need for duplexer in Radar-Working of branch type Duplexer with sketch-Types of indicators used in radar systems- A-scope and PPI displays-Disadvantages of pulsed radar- Doppler Effect-Explain the principle of CW radar-Block diagram of CW radar-Limitations of a CW Radar-Working of FM CW Radar-Application of FM CW Radar as altimeter-Block diagram of MTI Radar-Applications of various Radar systems-Principle of instrument landing system.

5. Satellite Communication:

Need for satellite communication-Foot print of a satellite-Basic structure and uses of microwave links-Fixed microwave link with block diagram-Advantages of satellite communication over terrestrial radio communication-Geostationary satellites and satellites in lower orbits-Advantages and disadvantages geostationary satellites-Azimuth and elevation with reference to satellites-Apogee and perigee-Uplink frequency and down link frequency-Functions of a transponder-Types of transponders used in satellites (single conversion, double conversion and regenerative)-Working of the three types of transponders-Bandwidth allocation of a satellite-Methods of increasing satellite capacity-Methods of increasing channel capacity- Frequency reuse, polarization and spatial isolation)-Block diagram of communication satellite-Block diagram of Earth station-Working of GPS-Applications of satellites.- Factors affecting satellite communication

REFERENCE BOOKS:

1. Electronic communication system by George Kennedy, TMH
2. Electronic communications systems by Roy Blake, Thomson Delmar,2002.
3. Introduction to RADAR Engineering by Merryl I Skolnik. TMH
4. Microwave Integrated circuits by Samuel Leo 3 ed.-Prentice Hall

DIGITAL COMMUNICATIONS

Subject title : Digital **Communications**

Subject code : EC-404

Periods/week : 05

Periods/semester : 75

Rationale ; Digital communication is a core subject which gives a clear insight in to the concepts of digital Communication. Emphasis is laid on fundamental concepts and practical applications.

TIME SCHEDULE

Sl	Major topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Principles of Digital Communication	16	16	2	1
2	Error Detection & Correction	15	26	2	2
3	Digital Modulation Techniques	16	26	2	2
4	Multiplexing Techniques	16	26	2	2
5	Telephone Systems	12	16	2	1
Total		**75**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student should be able to

1.0 Understand the principles of Digital Communication

1.1 Explain analog and digital signals.

1.2 Compare analog and digital communication techniques.
1.3 Define information capacity of a channel.
1.4 State sampling theorem and explain its significance.
1.5 Classify pulse modulation techniques.
1.6 Explain PAM,PWM and PPM with waveforms
1.7 Explain the generation and demodulation of PAM with block diagram.
1.8 List the advantages and disadvantages of PAM.
1.9 Explain the generation and demodulation of PWM with block diagram.
1.10 List three advantages and disadvantages of PWM
1.11 List three advantages and disadvantages of PPM
1.12 Compare PAM, PWM and PPM.
1.13 Define quantization,
1.14 Explain the process of quantization with waveforms.
1.15 Define quantization noise.
1.16 Define bit rate, and dynamic range for PCM systems.
1.17 Describe the coding and decoding of a PCM signal.
1.18 Explain delta modulation with block diagram.
1.19 Explain the advantages of delta modulation over PCM.
1.20 Explain adaptive delta modulation with block diagram and waveform
1.21 Compare PCM, DM and ADM
1.22 Mention different data compression techniques.
1.23 Explain the operation of *Vocoders.*

2.0 Understand the principles of Digital Data Transmission

2.1 List four digital signal encoding formats
2.2 Explain NRZ line coding techniques.
2.3 Explain RZ line coding techniques
2.4 Understand the various error detection and correction techniques.
2.5 Define the term bit overhead.
2.6 Define overhead efficiency.
2.7 Explain the conversion between parallel and serial data.
2.8 Explain the process of synchronous transmission.
2.9 List different types of errors during data transmission.
2.10 Mention different error detection techniques.

2.11 Explain parity check method of error detection.
2.12 Explain VRC method of error detection with an example.
2.13 Explain LRC method of error detection with an example.
2.14 Explain Checksum method of error detection.
2.15 Explain CRC method of error detection with an example.
2.16 State the advantages of CRC method of error detection.
2.17 List different error correction techniques.
2.18 Explain retransmission method of error correction.
2.19 Explain symbol substitution method of error correction.
2.20 Explain importance of hamming code in error detection and correction.

3.0 Understand various Digital data Modulation Techniques.

3.1 State the need for digital modulation
3.2 Explain the difference between bit rate and baud rat
3.3 List the three basic types of digital modulation techniques.
3.4 Define ASK,FSK and PSK
3.5 Explain ASK modulator with block diagram.
3.6 Explain ASK coherent demodulator with block diagram
3.7 List four merits &demerits of ASK
3.8 Explain BFSK modulator with block diagram.
3.9 Explain Coherent BFSK demodulator.
3.10 List three merits & demerits of FSK.
3.11 Draw and explain BPSK modulator.
3.12 Draw and explain BPSK demodulator.
3.13 List four advantages of BPSK
3.14 Compare ASK, FSK and PSK.
3.15 Explain Quadrature Amplitude Modulation (QAM).
3.16 State typical application areas of different digital modulation techniques.

4.0 Understand the principles of Multiplexing techniques.

4.1 State the need for multiplexing
4.2 Explain Frequency Division Multiplexing
4.3 Explain Time Division Multiplexing.
4.4 List four merits &demerits of TDM

4.5 Compare TDM and FDM
4.6 State the need for a modem in data communication.
4.7 Explain the operation of telephone modem.
4.8 Explain the difference between fax and data modem.
4.9 Explain cable modems.
4.10 Explain Digital Subscriber Line (DSL).
4.11 Explain Asymmetrical Digital Subscriber Line (ADSL) technology
4.12 Explain ISDN
4.13 State the advantages of ISDN.

5.0 Know the Telephone System.

5.1 Classify different switched telephone systems.
5.2 Explain the topology of the switched telephone network.
5.3 Mention the advantages of electronic telephony over manual telephony.
5.4 Define local loop in telephone system.
5.5 Mention various signals present on a local-loop telephone line.
5.6 State the functions of various signals present on a local-loop telephone line.
5.7 List the types of dialing.
5.8 Explain pulse dialing and DTMF.
5.9 State the advantages of DTMF.
5.10 Compare in-band and out-of-band signaling systems for telephony.
5.11 Explain the use of Signal system Seven (SS7).
5.12 Explain the use of FDM in telephony
5.13 Explain the use of TDM in telephony.
5.14 Explain Internet telephony/IP telephony (VOIP).

COURSE CONTENT:

1.0 Principles of Digital Communication

Analog and digital signals-Compare analog and digital communication techniques.

Information capacity of a channel- Sampling theorem and its significance.

Pulse modulation techniques- PAM,PWM and PPM with waveforms- Advantages and disadvantages of PAM- Generation and demodulation of PAM with block diagram- Advantages and disadvantages of PAM- Explain PWM and PPM with waveforms- Explain the generation

and demodulation of PWM with block diagram - Advantages and disadvantages of PWM- Advantages and -Disadvantages of PPM-Compare PAM, PWM and PPM- Quantization- Quantization waveforms- Quantization noise- Bit rate, and dynamic range for PCM systems- Coding and decoding of a PCM signal- Delta modulation - Block diagram- Advantages of delta modulation over PCM- Adaptive delta modulation with block diagram and waveform-Compare PCM, DM and ADM- *Vocoders*- Data compression techniques.

2.0 Principles of Digital Data Transmission

Digital signal encoding formats- NRZ line coding techniques- RZ line coding techniques- Error detection and correction techniques- Bit overhead- overhead efficiency- Conversion between parallel and serial data- Synchronous transmission- Types of errors during data transmission- Error detection techniques- Parity check method of error detection- VRC method of error detection - LRC method of error detection with an example- Checksum method of error detection- CRC method of error detection with an example- Advantages of CRC method of error detection- Error correction techniques- Retransmission method of error correction- Symbol substitution method of error correction- Importance of hamming code in error detection and correction

3.0 Digital data Modulation Techniques.

Need for digital modulation - Bit rate and baud rate -Types of digital modulation techniques- ASK,FSK and PSK- ASK modulator with block diagram- ASK coherent demodulator with block diagram- advantages & disadvantages of ASK- BFSK modulator with block diagram- Coherent BFSK demodulator- - Advantages and disadvantages of FSK- BPSK modulator- BPSK demodulator- advantages of BPSK—Comparison of ASK, FSK and PSK- Quadrature Amplitude Modulation (QAM)- application areas of different digital modulation techniques

4.0 Principles of Multiplexing techniques.

Need for multiplexing- Frequency Division Multiplexing- Time Division Multiplexing- Advantages & disadvantages of TDM-Comparison of TDM and FDM- Need for a modem in data communication- Operation of telephone modem- Difference between fax and data modem- Cable modems- Digital Subscriber Line (DSL)- Asymmetrical Digital Subscriber Line (ADSL) technology- ISDN- Advantages of ISDN.

5.0 Telephone System.

Classification of switched telephone systems- Topology of the switched telephone network- Advantages of electronic telephony over manual telephony- Local loop in telephone system- Signals present on a local-loop telephone line- Functions of various signals present on a local-loop telephone line- Types of dialing.

pulse dialing and DTMF- advantages of DTMF- in-band and out-of-band signaling systems for telephony- Signal system Seven(SS7)- FDM in telephony- TDM in telephony- IP telephony (VOIP).

REFERENCES BOOKS:

1. Electronic communications systems by Roy Blake, Thomson Delmar
2. Analog & Digital Communication by T L Singal, Tata McGraw Hill.
3. Electronic Communication System by George Kennedy.

4. Electronic Communication Systems A Complete Course –4th Edi by Schweber PHI

5. Communication systems :Analog and Digital by RP Singh, SD Spare, Tata McGraw Hill.

MICRO CONTROLLER PROGRAMMING

Subject title : Micro Controller Programming

Subject code : EC-405

Periods/week : 05

Periods/semester : 75

Rationale : Microcontroller programming is a core subjects which gives a clear insight in to the Use of Microcontrollers and other integrated circuits in Industrial applications . Emphasis is laid on fundamental concepts and practical applications to enable the student ready for Industry.

TIME SCHEDULE

Sl	**Major topics**	**No. of periods**	**Weightage of marks**	**Short Answer Questions**	**Essay Questions**
1	8051 Architecture	20	26	2	2
2	Instruction set of 8051	18	26	2	2
3	Programming Concepts	15	26	2	2
4	Hardware Interfacing	12	16	2	1
5	8051 Programming in C	10	16	2	1
Total		**75**	**110**	**10**	**8**

OBJECTIVES:

Upon completion of the course the student should be able to

1.0 Comprehend the architecture of Microcontroller 8051

1.1 Draw the block diagram of a microcomputer and explain the function of each block.

1.2 List the features of micro controllers.

1.3 Compare Microprocessors and Microcontrollers

1.4 State the details of INTEL microcontroller family chips.

1.5 State the features of Intel 8051 Micro Controller.

1.6 Draw the functional block diagram of 8051 microcontroller

1.7 Draw the register structure of 8051and explain.

1.8 Explain the function of various special function registers.

1.9 Draw the pin diagram of 8051 micro controller and specify the purpose of each pin.

1.10 Explain internal memory Organization in 8051

1.11 Explain external memory access in 8051

1.12 Explain various ports of 8051.

1.13 Explain counters & timers in 8051

1.14 Explain serial input/output of 8051

1.15 Explain interrupts in 8051

2.0 Comprehend the instruction set of 8051 micro controller

2.1 State the need for an instruction set.

2.2 Write the instruction format of 8051 & illustrate these terms by writing an instruction.

2.3 Explain fetch cycle, execution cycle and instruction cycle.

2.4 Distinguish between machine cycle and T-state.

2.5 Explain the timing diagram for memory write & Memory read operation of 8051

2.6 Define the terms machine language, assembly language, and mnemonics.

2.7 Write the differences between machine level and assembly level programming.

2.8 Classify the instruction set of 8051.

2.9 Explain one byte, two byte and three byte instructions of 8051.

2.10 List the various addressing modes of 8051and Explain with examples.

2.11 Explain data transfer instructions of 8051.

2.12 Explain the arithmetic instructions and recognize the flags that are set or reset for given data conditions.

2.13 Explain the logical instructions and recognize the flags that are set or reset for given data conditions.

2.14 Explain bit-level logical instructions.

2.15 Explain Boolean group of instructions.

2.16 Explain unconditional and conditional jumps.

2.17 Explain unconditional & conditional jump instructions.

3.0 Comprehend 8051 Programming Concepts

3.1. List the various symbols used in drawing flow charts.

3.2. Draw flow charts for simple problems.

3.3. Write programs in mnemonics to illustrate the application of data copy instructions.

3.4. Illustrate the application of jump instruction in the program.

3.5. Write a program using counter techniques.

3.6. Write programs of instructions to perform single byte, double byte and multi byte addition and subtraction.

3.7. Define a subroutine and explain its use.

3.8. Explain the sequence of program when subroutine is called and executed.

3.9. Explain information exchange between the program counter and the stack and identification of stack pointer register when a subroutine is called.

3.10. Explain PUSH & POP instructions.

3.11. Illustrate the concept of nesting, multiple ending and common ending in subroutines.

3.12. Use input/output, machine related statements in writing assembly language programs.

3.13. Explain the term debugging a program.

3.14. List the important steps in writing and trouble shooting a simple program.

3.15. Explain the principles of single step and break point debugging techniques.

3.16. Write simple programs to setup time delay using counter & a single register.

3.17. Calculate the time delay in the program given the clock frequency.

4.0 Hardware Interfacing

4.1 Explain the Interfacing of push button switches and LEDs.

4.2 Explain the interfacing of Seven segment display .

4.3 Mention the reasons for the popularity of LCDs

4.4 Explain the functions of pins of LCD

4.5 List instruction command code for programming a LCD

4.6 Explain Interfacing LCD to 8051

4.7 Explain assembly language Program for interfacing LCD .

4.8 Explain the basic operations of keyboard

4.9 Explain key press and detection mechanisms

4.10 Explain Interfacing a 4 X 4 Matrix Key Board.

4.11 Explain RS232 standards

4.12 List RS232 pin , DB 25 and DB 9 connectors

4.13 Explain MAX 232 and 233 and interfacing

5.0 8051 Programming in C

5.1 Explain the need for Programming in High level languages like C

5.2 List different data types in C

5.3 Explain the use of Unsigned char and signed Char with examples

5.4 Explain the use of Unsigned int and signed int with examples

5.5 Explain sbit with an example

5.6 Explain bit and SfR

5.7 Explain writing a program to produce time delay Using a) for loop b)Using 8051 Timers

5.8 Explain I/O programming in C with examples for Byte size

5.9 Explain Bit addressable I/O programming with example

5.10 Explain accessin SFR addresses 80-FFH with an example prohram in C

5.11 Explain using bit data type for Bit addressable RAM

5.12 Explain logic operations in C

5.13 Mention bitwise operators in C

5.14 Explain bitwise shift operation in C

5.15 Explain data serialization using C

COURSE CONTENT:

1.0 Architecture of 8051

Features of micro controllers- Comparison of Microprocessors and Microcontrollers- Block diagram of a microcomputer - Function of each block- details of 8051 microcontroller family chips- Block diagram of 8051 microcontroller- Register structure of 8051and explain- Function of various special function registers- Pin diagram of 8051 micro controller - Internal memory,

external memory and ports of 8051- Counters & timers in 8051- Serial input/output of 8051- Interrupts in 8051- Different modes of operation.

2.0 Instruction set of 8051 micro controller

Instruction set- Instruction format of 8051- Fetch cycle, execution cycle and instruction cycle- Machine cycle and T-state- Timing diagram for memory write, memory read operations of 8051- Machine language, assembly language, and mnemonics- Difference between machine level and assembly level programming- Major groups in the instruction set - Operation code, operand data manipulation functions, data transfer, arithmetic, logic and branching –Classification of 8051 instructions into one byte, two byte and three byte instructions- various Addressing modes of - Data transfer instructions of 8051- Arithmetic instructions - Flags - Logic instructions - Flags - Data conditions- Logic operations - Their use in making, setting and resetting of individual bits- Unconditional and conditional jump –Use of flags to change the sequence of program

3.0 Programming Concepts of 8051

Various symbols used in drawing flow charts- Flow charts Examples - Programs in mnemonics to illustrate the application - Translate mnemonics into hex codes- Instructions to perform single byte, double byte and multi byte addition and subtraction- Application of jump -Instruction in the program- Program using counter techniques- Subroutine and its use- Sequence of program when subroutine is called and executed- Information exchange between the program counter and the stack - Identification of stack pointer register when a subroutine is called- Unconditional and conditional call and return instructions- PUSH, POP instructions in programs- Concept of nesting, multiple ending and common ending in subroutines- input/output, machine related statements in writing assembly language programs- Debugging a program- Important steps in writing and trouble shooting a simple program- Principles of single step and break point debugging techniques- Instructions to set up time delay.

4.0 Hardware Interfacing for 8051

Interfacing of push button switches and LEDs- Seven segment display interface- Reasons for the popularity of LCDs -Explain the functions of pins of LCD- Instruction command code for programming a LCD- Interfacing LCD to 8051- Assembly language program for LCD interface- Basic operations of keyboard- key press and detection mechanisms- Interfacing a 4 X 4 Matrix Key Board- RS232 standards - RS232 pin , DB 25 and DB 9 connectors - MAX 232 and 233 and interfacing

5.0 8051 Programming in C

Need for Programming in High level languages like C-different data types in C- use of Unsigned char and signed Char Unsigned int and signed int - sbit - bit and SfR- program to produce time delay- for loop - 8051 Timers- I/O programming in C with examples for Byte size - Bit addressable I/O programming - accessing SFR addresses 80-FFH - using bit data type for Bit addressable RAM- logic operations in C- bitwise operators in C- bitwise shift operation in C- data serialization using C

REFERENCE BOOKS:

1. The 8051 Micro controller and Embedded systems , by Muhammad Ali Mazidi, Janice Mazidi, Janice Gillispie Mazidi Pearson-Prenticehall publication
2. The 8051 Microcontroller By Kenneth J. Ayala -Thomson Delmar publications
3. Programming customizing the 8051 Microcontroller by Myke Predko, TMH
4. Introduction to microprocessors for engineers and scientists by by Ghosh & Sridhar, Prentice-Hall.
5. Microprocessors and Microcontrollers by N.Senthil Kumar, M. Saravanan, S. Jeevanathan, Oxford press.

PROGRAMMING IN 'C'

Subject Title : PROGRAMMING IN C
Subject Code : EC- 406
Periods / Week : 05
Periods / Sem. : 75

Rationale ; Programming in C is introduced as the programming skills have become very common even at school level The knowledge of c programming is essential for courses in microcontrollers Emphasis is laid on fundamental concepts and practical applications . Further Programming knowledge is a must in the industry.

TIME SCHEDULE

Sl.	Major Topics	Periods	Weightage of marks	Short Type	Essay Type
1	C Programming Basics	12	16	2	1
2	Decision & Loop Control Statements	15	26	2	2
3	Arrays & Strings	11	26	2	2
4	Functions and Pointers in C	22	26	2	2
5	Structures, Unions & Pre-processor Directives	15	16	2	1
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

Upon completion of the course the student should be able to

1.0 Understand C Programming Basics.

1.1 List the character set of C language

1.2 Explain the data types in C

1.3 Explain the various operators used in 'C'

1.4 List the five Arithmetic Operators

1.5 List the relational Operators.

1.6 List the logical Operators

1.7 List the bit-wise Operator

1.8 Define an expression and show how to evaluate.

1.9 Explain writing the assignment statement.

1.10 Explain the increment and decrement operators.

1.11 Identify compound Assignment Operators.

1.12 Write assignment and compound assignment statement.

1.13 Explain the Nested assignments.

1.14 Write nested assignment statement.

1.15 Explain printf ()and scanf () functions

1.16 Mention various type of conversion techniques and discuss them.

1.17 List the four relational operators.

1.18 List the three logical operators supported by 'C'

1.19 Give the operator precedence.

1.20 Explain the operator precedence by writing an expression.

1.21 Evaluate a logical expression.

1.22 Explain bitwise logical operators.

2.0 Understand Decision & Loop Control Statements

2.1 Write the format of conditional expression with an example.

2.2 List the four conditional statements supported by C

2.3 Explain If, If-else and If-else-If statements.

2.4 Explain Switch Case statement.

2.5 Write simple programs based on conditional statements.

2.6 List the three types of iterative statements supported by C.

2.7 Explain while loop, Do-While and For loops.

2.8 Differences between while-loop, do-while and for-loops.

2.9 Explain the nested loops

2.10 write simple programs based on nested loops

2.11 Differentiate break and continue statements.

2.12 Mention the use of null statement and comma operator.

3.0 Understand Arrays & Strings

3.1 Define one dimensional and two dimensional arrays.

3.2 Explain declaration and initialization of One dimensional array with syntax and sample program.

3.3 Explain declaration and initialization of Two dimensional array with syntax and sample program

3.4 Explain accessing the elements in an array using sample programs.

3.5 Write sample programs on matrix addition and multiplication and also transpose of a matrix.

3.6 Explain the initialization of the above arrays Access Array elements.

3.7 Explain Passing array elements as arguments and arrays as arguments.

3.8 Define string.

3.9 List three functions used for reading strings

3.10 List three functions used for writing strings.

3.11 Write the operation of getchar(), getch(), getche() and putchar() functions.

3.12 Write the operations of string manipulation functions strcat(), strchr(), strncmp(), strcpy(), and strlen()

3.13 Write simple programs based on string manipulation functions.

4.0 Understand Functions & Pointers

4.1 Define a function.

4.2 State the use of return statement.

4.3 Explain passing parameters to the function by using “call by value technique” with a sample program.

4.4 Write programs using function call technique.

4.5 List the four storage classes supported by C.

4.6 Differentiate local and external variables.

4.7 Identify automatic and static variables and discuss them in detail

4.8 State the application of external declaration.

4.9 Define a global variable.

4.10 Explain passing array elements as arguments to functions with a sample program.

4.11 Explain passing arrays as arguments to functions with a sample program.

4.12 Define Recursion and Explain with examples.

4.13 Declare a pointer, assign a pointer, and initialize a pointer.

4.14 State how to use pointer variables in arithmetic operations.

4.15 Differentiate address and de referencing operators.

4.16 Illustrate with an example how pointer can be used to realize the effect of parameter passing by reference.

4.17 Explain passing parameters to the function by using “call by reference technique” with a sample program.

4.18 Explain the relationship between arrays and pointers with examples

4.19 Explain pointer arrays with example.

4.20 Explain the concept of pointers to functions.

5.0 Understand Structures, Unions and preprocessor directives

5.1 Define a structure

5.2 Explain a structure variable with example.

5.3 Explain initialization of structures.

5.4 Explain the accessing of members of a structure.

5.5 Mention the differenece between initialization and assignment of a structure.

5.6 Explain how to find size of a structure with the help of a program.

5.7 Explain nested structure concept.

5.8 Explain passing of individual members of a structure to a function

5.9 Explain passing entire structure as function argument.

5.10 Explain the concept of structures containing pointers.

5.11 Define a Union

5.12 Differences between structure and union.

5.13 List six unconditional pre-processor directives.

5.14 List six conditional pre-processor directives.

5.15 Explain the pre-processing directives: define, include, ifdef, ifndef.

COURSE CONTENT

1.0 C Programming Basics

Character set of C language - Data types in C -Arithmetic Operators – Expressions- Evaluation- Assignment statement- Increment and Decrement operators- Compound Assignment Operators- Nested assignments- printf ()and scanf () functions- Type conversion techniques - Relational operators- Logical operators supported by 'C'- operator precedence-Evaluation of a logical expression- Bitwise logical operators.

2.0 Decision & Loop Control Statements

Importance of conditional expression- Conditional statements supported by C- If, If-else and If-else-If statements- Switch Case statement- Simple programs based on conditional statements- Types of iterative statements supported by C- While loop, Do-While and For loops- Nested loops- simple programs based on nested loops- Break and continue statements- Use of null statement and comma operator.

3.0 Arrays & Strings

One dimensional and two dimensional arrays- Initialization of the above arrays- Access Array elements- Passing array elements as arguments and arrays as arguments- string- Functions used for reading strings- Functions used for writing strings- Operation of getchar(), getch(), getche() and putchar() functions- String manipulation functions strcat(), strchr(), strncmp(), strcpy(), and strlen()-Simple programs based on string manipulation functions

4. Functions & Pointers

Function- use of return statement- Passing parameters to the function- Programs using function call technique- Storage classes supported by C- Local and external variables-Identify automatic and static variables and discuss them in detail- Application of external declaration- Recursion and examples- pointer, assign and initialize a pointer- Pointer arithmetic- Address and de referencing operators- Use of pointer to realize the effect of parameter passing by reference- relationship between arrays and pointers- Pointer arrays with example- Concept of pointers to functions.

5.0 Structures, Unions and preprocessor directives

Structure- Structure variable- Initialization of structures- Accessing of members of a structure- Concept of structure assignment- Size of a structure- Nested structure concept- Passing of Individual members of a structure to a function- Passing entire structure as function argument.

Illustrate the concept of structures containing pointers- Union - Use of a union- Unconditional preprocessor directives- Conditional preprocessor directives- Preprocessing directives: define, include, ifdef, ifndef.

REFERENCE BOOKS:

1. Programming in ANSI C,Balaguru Swamy.E , 3rd Edition, TMH
2. Programming with ANSI and Turbo C by Kamthane, Pearson Education
3. Programming in C by Gottfried (Schaum Series)
4. Programming in C by Reema Thareja, Oxford university press.
5. Let us C, by Yashwant Kanetkar, BPB Publication, New Delhi

LINEAR INTEGRATED CIRCUITS LAB PRACTICE

Subject Title	:	Linear Integrated Circuits Lab Practice
Subject Code	:	EC-407
Periods/Week	:	3
Periods/Semester	:	45

Rationale:

Linear integrated circuits lab is introduced to reinforce the theoretical knowledge by experimental verification. Experiments on opamps are designed in such a way they also give insight into design concepts.

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
I.	**Operational Amplifier Circuits**	9
II.	**Wave shaping Circuits**	9
III.	**Opamp Oscillators &555 Timer IC**	9
IV.	**Phase locked loops**	9
V.	**Op Amp applications**	9
	Total	45

Note: Sub experiments may be conducted subject to the availability of components and equipment

List of Experiments

I. Operational Amplifier Circuits

1. Familiarize with Operational amplifier 741 and Quad Opamp LM 324 and comparator LM 339 ICs

2. Determine the CMRR and Slew Rate of the OP-AMP.

3) Implement and test 741 OpAmp as

a) inverting amplifier

b) Non Inverting amplifier

c) Voltage follower (Buffer),

4) implement and test 741 Operation amplifier as

a)summing Amplifier

b) Difference amplifier

c) Scale changer (with two OpAMps)

II. Wave shaping Circuits

5. Realize Clipper and Clamper circuits and observe the waveforms on CRO

A) Realize Series and Parallel diode clippers

B) Assemble and test Positive and negative clipper circuits with and without bias

c) implement Amplitude limiter (two diodes connected back to back) and observe the waveform on CRO.

D) Implement a Zener diode Clipper and measure the output voltage with DMM and also observe waveform on CRO

6. implement Wave shaping circuits using OpAmp

a) implement &test Differentiator and Integrator circuits .

b) implement &test a Voltage comparator Circuit

c)implement &test Opamp Schmitt trigger and draw charactersistics

III. Signal conditioning Circuits using Opamp

7) implement &test **Signal conditioning Circuits using Opamp**

a) Interface op amp output with TTL gates with input amplitude limiting circuit

b) implement &test Current to Voltage converter using Op amps

c) Implement &test Current to Voltage converter and use it to detect photodiode reverse current.

8. implement &test Voltage to current converter

a) Implement &test a Voltage to current converter that produces a proportionate current in the range of 4mA to 20mA corresponding to input voltages from 0 to 5V

III. Opamp Oscillators &555 Timer IC

9) implement & test Sine wave Oscillator Circuits using OpAmp CA 3011

a) RC-phase shift oscillator

b) Wien bridge oscillator

) implement Op-Amp Relaxation Oscillators

a) implement &test Monostable multivibrator circuit and observe output waveforms on CRO

b) Implement &test Astable multivibrator observe output waveforms on CRO

10) Verify different modes of 555 IC.

a) Implement Monostable multi vibrator and observe output waveforms on CRO

b) Implement Astable multivibrator and observe output waveforms on CRO

11) verify functions of 565 Phase Locked loop IC

A) Implement 565 Phase locked loop circuit and determine VCO free running frequency Lock range , Capture Range Practically and observe output waveforms on CRO

b) implement Frequency demodulator using 565 and observe output waveform on CRO.

12) Use 566 as a square and Triangular wave generator

a) implement waveform /Function generator using 566 .

b) produce Frequency modulation using 566 and observe output waveform on CRO.

13) verify the features of Tone Decoder IC 567 IC

(Refer to the application notes and implement following circuits)

a) Implement 10 Khz signal detector and test

b) implement frequency Doubler and test .

14) Implement &Test Precision Rectifier using Opamp

15) Assemble Audio Power Amplifier circuit using LM 380 IC and Test the performance.

Competencies & Key Competencies to be achieved

Exp No	Name of the Experiment	Competencies	Key Competencies
1	**To familiarize with Operational amplifier 741 and Quad opamp LM 324 and comparator LM 339 Ics (1)**	➢ **I**dentify the iC package ➢ Identify Power supply pins , inverting & Non inverting input pins of 741 and other ICs ➢ Refer to the data sheets & note down the specifications , Package details etc	▪ Identify the OpAmp IC from the number ▪ Identify & Draw the pin Configuration ▪ Interpret datasheet specifications
2	**To Determine the CMRR and Slew Rate of the OP-AMP.(2)**	➢ Rig up the circuit ➢ Set correct +ve and – Ve Vcc ➢ Apply Common signal to the IC input Pins ➢ Measure the output voltage accurately ➢ Observe & Measure the signal on CRO ➢ Compare other Opamp Specifications from datasheets	▪ Apply Common signal to the IC input Pins ▪ Measure the output voltage accurately ▪ Observe & Measure the signal on CRO ▪ Select rigt op amp for a given application from data sheets
3	**To implement and test 741 Operation amplifier as (3)**	➢ Rig up the circuit . ➢ Choose correct values of feedback and input	▪ Rig up the circuit . ▪ Choose correct values of feedback and input

	a) inverting amplifier b) Non Inverting amplifier c) Voltage follower (Buffer),	Resistors ➢ Measure input & Output signals with DMM	Resistors ▪ Measure input & Output signals with DMM
4	**To implement and test 741 Operation amplifier as(3)** a)summing Amplifier b) Difference amplifier c) Scale changer (with two OpAMps)	➢ Rig up the circuit . ➢ Choose correct values of feedback and input Resistors ➢ Measure input & Output signals with DMM	▪ Rig up the circuit . ▪ Choose correct values of feedback and input Resistors ▪ Measure input & Output signals with DMM
4	**To Realize Clipper and Clamper circuits and observe the waveforms on CRO (3)** A) To Realize Series and Parallel diode clippers B) To Assemble and test Positive and negative clipper circuits with and without bias c) To implement Amplitude limiter (two diodes connected back to back)	➢ Rig up the circuit ➢ Apply correct level of input signal from Function generator ➢ Observe & Measure the input and output waveforms on CRO	▪ Apply correct level of input signal from Function generator ▪ Observe & Measure the input and output waveforms on CRO ▪ Use the Clipper circuits in practical applications

	and observe the waveform on CRO. d)To Implement a Zener diode Clipper and measure the output voltage with DMM and also observe waveform on CRO		
5	**To implement Wave shaping circuits using OpAmp(3)** a)To implement Differentiator and Integrator circuits . b) To implement a Voltage comparator Circuit c) To implement Opamp Schmitt trigger and draw characteristics	➢ Rig up the circuit ➢ Choose correct values for components to achieve desired time constant ➢ Observe& measure the input and output wave forms on CRO. ➢ Observe the effect of change in circuit Time constant	▪ Observe& measure the input and output wave forms on CRO. ▪ Observe the effect of change in circuit Time constant ▪ Use the Opamp for wave shaping &other applications.
6	**To implement Signal conditioning Circuits using Opamp (3)** a) To Interface op amp output with TTL gates with input amplitude limiting circuit	➢ Rig up the circuit ➢ Apply correct levels of Input signals ➢ Measure the Input / Output Voltages and currents using DMM	▪ Apply correct levels of Input signals ▪ Measure the Input / Output Voltages and currents using DMM ▪ Use OpAmp as I/V converter

	b) To implement Current to Voltage converter using Op amps c) To Implement Current to Voltage converter and use it to detect photodiode reverse current.		
7	**To implement Voltage to current converter (3)** a)To Implement a Voltage to current converter that produces a proportionate current in the range of 4mA to 20mA corresponding to input voltages from 0 to 5V	➢ Rig up the circuit ➢ Apply correct levels of Input signals ➢ Measure the Input / Output Voltages and currents using DMM	▪ Apply correct levels of Input signals ▪ Measure the Input / Output Voltages and currents using DMM ▪ Use opamp as V/I converter
8	**To implement Sine wave Oscillator Circuits using OpAmp CA 3011 (3)** a) RC-phase shift oscillator b) Wien bridge oscillator	➢ Familiarize with CA 3011 pin configuration ➢ Choose correct values for frequency determining components ➢ Rig up the circuit Observe & measure the output waveform on CRO	▪ Choose correct values for frequency determining components ▪ Observe & measure the output waveform on CRO ▪ Change RC component Values & Observe the effect on

		➢ Change RC component Values & Observe the effect on output signal on CRO	output signal on CRO ▪ Use CA3011 Opamp for single supply applications
9	**To implement &test Op-Amp Relaxation Oscillators (3)** a) To implement Monostable multivibrator circuit and observe output waveforms on CRO b) To Implement Astable multivibrator observe output waveforms on CRO	➢ Choose correct values for frequency determining components ➢ Rig up the circuit Observe & measure the output waveform on CRO ➢ Change RC component Values & Observe the effect on output signal on CRO	▪ Choose correct values for frequency determining components ▪ Observe & measure the output waveform on CRO ▪ Change RC component Values & Observe the effect on output signal on CRO ▪ Design Opamp circuits for pulse &square wave generator applications
10	**To Verify different modes of 555 IC.** (3) a) Implement Monostable multi vibrator b) Implement Astable multivibrator	➢ Choose correct values for frequency determining components ➢ Rig up the circuit Observe & measure the output waveform on CRO c. Change RC component Values &	▪ Choose correct values for frequency determining components ▪ Observe & measure the output waveform on CRO ▪ Change RC component Values &

		Observe the effect on output signal on CRO	Observe the effect on output signal on CRO
11	**To verify functions of 565 Phase Locked loop IC (3)** A) To design &Implement 565 Phase locked loop circuit and determine VCO free running frequency Lock range , Capture Range Practically and observe output waveforms on CRO b) To design & implement Frequency demodulator using 565 and observe output waveform on CRO.	➢ familiarize with 565 pin configuration Choose correct values for frequency determining components ➢ Rig up the circuit ➢ Observe & measure the output waveform on CRO Change RC component Values & Observe the effect on output signal on CRO ➢ Interpret the specifications of 565 IC from datasheets	▪ Choose correct values for frequency determining components ▪ Rig up the circuit ▪ Observe & measure the input & output waveform on CRO ▪ Change RC component Values & Observe the effect on output signal on CRO ▪ Interpret the specifications of 565 Iv from datasheets
12	**To implement &Test waveform /Function generator using 566** .(3) a) To produce Frequency modulation using 566 and observe output waveform on CRO.	➢ Familiarize with 566pin configuration Choose correct values for frequency determining components ➢ Rig up the circuit ➢ Observe & measure the output waveform on	▪ Choose correct values for frequency determining components ▪ Observe & measure the output waveform on CRO Change RC component Values & Observe the effect on

		CRO ➢ Change RC component Values & Observe the effect on output signal on CRO ➢ Interpret the specifications of 566 IC from datasheets	output signal on CRO ▪ Interpret the specifications of 566 IC from datasheets
13	**To verify the features of Tone Decoder IC 567 IC (3)** (Refer to the application notes and implement following circuits) a) To Implement 10 Khz signal detector and test b) To implement frequency Doubler and test .	➢ Familiarize with 567 pin configuration Choose correct values for frequency determining components ➢ Rig up the circuit ➢ Observe & measure the output waveform on CRO ➢ Change RC component Values & Observe the effect on output signal on CRO ➢ Interpret the specifications of 566 IC from datasheets	▪ Choose correct values for frequency determining components ▪ Observe & measure the input/output waveform on CRO ▪ Change RC component Values & Observe the effect on output signal on CRO ▪ Interpret the specifications of 567 IC from datasheets
14	To implement precision rectifier using Opamp (3)	➢ Implement the circuit ➢ Apply input AC signal ➢ Observe & measure the output waveform on CRO	▪ Implement the circuit ▪ Test the circuit

15	To assemble Audio Power Amplifiers using LM 380 IC and Test the performance. (3)	➢ Familiarize with pin configuration of LM 380 IC ➢ Assemble the circuit (without speaker) ➢ Carry out Performance test (Frequency response) ➢ Connect the Microphone & speaker and test	▪ Assemble the circuit (without speaker) ▪ Carry out Performance test (Frequency response) ▪ Connect the Microphone & speaker and test

DIGITAL COMMUNICATION LAB PRACTICE

Subject Title : Digital Communication Lab Practice

Subject Code : EC – 408

Periods/Week : 03

Periods/ Semester : 45

Rationale: Digital communication lab is designed to reinforce the theoretical concepts learnt in digital communication by experimental verification. Sound knowledge in Digital communication is essential to learn new technology trends in the ever growing communication Industry

TIME SCHEDULE

S.No.	Major Topic	No. of Periods
1	**Pulse Modulation**	**21**
2	**Time Division &Frequency Division Multiplexing**	**6**
3	**Signal Encoding (Keying) Techniques**	**12**
4	**DTMF Signalling**	**6**
5		**45**

LIST OF EXPERIMENTS

I. Pulse Modulation Techniques

1. Implement an opamp sample and hold circuit and test

2. implement D/A converter using R-2R ladder network/Binary Weighted type.

3.Verify sampling theorem and observe waveforms on CRO

b) sample an analog signal (using IC 398) at Nyquist rate and above Nyquist rate. And observe the waveforms

4. Verify and observe Pulse amplitude modulation and demodulation waveforms on CRO

5. Verify pulse position modulation and demodulation waveforms on CRO

6. Verify and observe Pulse Width modulation and demodulation waveforms on CRO

7. Verify and observe Pulse Code Modulation and Demodulation waveforms on CRO

B. Verify and observe Delta modulation and demodulation waveforms on CRO

II. Time Division &Frequency Division Multiplexing

8. Verify 2-channel TDM and observe input/output waveforms on CRO

9. Verify FDM. and observe input/output waveforms on CRO

III.Signal Encoding (Keying) Techniques

10 Generate and demodulate ASK signal and observe input/output waveforms on CRO

11.Generate and demodulate FSK signal and observe input/output waveforms on CRO

12. Generate and demodulate PSK signal

13. Observe line encoder &Decoder (*NRZ Signal)* waveforms on CRO for

a) *Unipolar and b) Bipolar techniques*

IV. DTMF Signalling

14 Generate DTMF signals using UM91214B IC/5089IC or any other equivalent ICs

15. Decode DTMF decoder using 8870 IC or its equivalent

Competencies and Key competencies to be achieved

Exp No	**Name of the Experiment**	**Competencies**	**Key Competencies**
1	To implement an opamp sample and hold circuit and test(3)	➢ a)Choose the right component values for holding capacitor and Resistor ➢ Rig up the circuit ➢ Apply correct level signal at input ➢ Measure and observe output waveforms on CRO ➢ b) Observe the effect of sampling rate on the output signal. ➢ c) Refer to data sheets for dedicated sample &Hold Ics and note down their specifications	▪ Apply correct level signal at input ▪ Measure and observe output waveforms on CRO ▪ Observe the effect of sampling rate on the output signal.
2	**To implement &Test D/A converter using R-2R ladder network/Binary Weighted type. (3)**	➢ Assemble the circuit ➢ Apply binary input signal ➢ Measure the output voltage	▪ Apply binary input signal ▪ Measure the output

	A)To Implement D/A converter using Opamp and R-2R ladder and Binary weighted network and test a)To Implement &Test Precision Rectifier using Opamp	with DMM ➢ Refer to the data sheets and note down the number of IC version of D/A converter and specifications	voltage with DMM
3	To verify sampling theorem and observe waveforms on CRO(3) b) To sample an analog signal (using IC 398) at Nyquist rate and above Nyquist rate. And observe the waveforms	➢ Make connections ➢ Apply correct level signal at input ➢ Measure and observe output waveforms on CRO ➢ Observe the effect of low sampling rate (aliasing) on the output signal	▪ identify PAM signal ▪ . Measure and observe output waveforms on CRO ▪ Observe the effect of low sampling rate (aliasing) on the output signal
4	To Verify and observe Pulse amplitude modulation and demodulation waveforms on CRO($1\frac{1}{2}$)	➢ Make connections ➢ identify various sections in PCM decoder ➢ Apply correct level signal at input ➢ Measure and observe output waveforms on CRO	▪ Apply correct level signal at input ▪ Measure and observe output waveforms on CRO ▪ Observe the effect of quantization on the output signal
5	To observe pulse position modulation and demodulation waveforms on CRO ($1\frac{1}{2}$)	➢ Make connections ➢ identify various sections in PPM Board ➢ Apply correct level signal at input ➢ Measure and observe	▪ Apply correct level signal at input ▪ Measure and observe input/output waveforms on CRO

		input/output waveforms on CRO ➢ Identify PPM signal	▪ Identify PPM signal
6	To Verify and observe Pulse Width modulation (PWM)and demodulation waveforms on CRO(3)	➢ Make connections ➢ identify various sections in PWM Board ➢ Apply correct level signal at input ➢ Measure and observe input/output waveforms on CRO ➢ Identify PWM signal.	▪ Apply correct level signal at input ▪ Measure and observe input/output waveforms on CRO ▪ Identify PWM signal
7	To observe line encoder &Decoder (*NRZ Signal)* waveforms on CRO *(3)* for a) *Unipolar and* *b) Bipolar techniques*	➢ Make connections ➢ identify various sections in Line encoder &Decoder Board ➢ Apply correct level signal at input ➢ Measure and observe input/output waveforms on CRO ➢ Identify Encoded and Decoded signals	▪ Apply correct level signal at input ▪ Measure and observe input/output waveforms on CRO ▪ Identify Encoded and Decoded signals
8	To Verify and observe Pulse Code Modulation and Demodulation waveforms on CRO(3) B. Verify delta modulation and demodulation on CRO	➢ identify various sections in PCM Board ➢ Make connections ➢ Apply correct level signal at input ➢ Measure and observe input/output waveforms on CRO Observe the effect of quantization and sampling on the output signal	▪ Apply correct level signal at input ▪ Measure and observe input/output waveforms on CRO ▪ Observe the effect of quantization and sampling on the output signal

9	To Verify 2-channel TDM and observe input/output waveforms on CRO(3)	➢ Identify various sections in TDM multiplexer ➢ Make connections ➢ Apply correct level signals at input ➢ Measure and observe input/output waveforms on CRO ➢ Measure the clock signal using CRO	▪ Make connections ▪ Apply correct level signals at input ▪ Measure and observe input/output waveforms on CRO ▪ Measure the clock signal using CRO
10	To Verify FDM. and observe input/output waveforms on CRO(3)	➢ Identify various sections in FDM multiplexer ➢ Make connections ➢ Apply correct level signals at input ➢ Measure & observe carrier and Baseband signals on CRO	▪ Apply correct level signals at input ▪ Measure and observe input/output waveforms on CRO ▪ Measure & observe carrier and Baseband signals on CRO
11	To generate and demodulate ASK signal and observe input/output waveforms on CRO(3)	➢ Identify various sections in ASK modulator Demodulator board ➢ Make connections ➢ Apply correct level signals at input ➢ Measure & observe carrier and Baseband signals on CRO	▪ Make connections ▪ Apply correct level signals at input ▪ Measure & observe carrier and Baseband signals on CRO
12	To generate and demodulate FSK signal and observe input/output waveforms. (3)	➢ Identify various sections in FSK modulator Demodulator board ➢ Make connections ➢ Apply correct level signals at input ➢ Measure and observe input/output waveforms on CRO	▪ Make connections ▪ Apply correct level signals at input ▪ Measure & observe carrier and Baseband signals on CRO

13	To generate and demodulate PSK signal(3)	➢ Identify various sections in PSK modulator Demodulator board ➢ Make connections ➢ Apply correct level signals at input ➢ Measure and observe input/output waveforms on CRO	▪ Make connections ▪ Apply correct level signals at input ▪ Measure and observe input/output waveforms on CRO
14	To generate DTMF signals using UM91214B IC/5089IC or any other equivalent ICs (3)	➢ Familiarize with Pin configuration of 5089 IC ➢ Observe DTMF signal waveforms on CRO ➢ Observe decoded DTMF signal on LED display	▪ Observe DTMF signal waveforms on CRO ▪ Observe decoded DTMF signal on LED display
15	a)To verify the function of DTMF decoder using 8870 IC or its equivalent	➢ Familiarize with Pin configuration of 8870 IC ➢ Observe DTMF signal waveforms on CRO ➢ Observe decoded DTMF signal on LED display	▪ Observe DTMF signal waveforms on CRO ▪ Observe decoded DTMF signal on LED display

MICROCONTROLLER PROGRAMMING LAB PRACTICE

SUBJECT TITLE : Microcontroller Programming Lab Practice
SUBJECT CODE : EC-409
PERIODS/WEEK : 03
PERIODS/SEMESTER : 45

Rationale: Microcontroller Applications Lab Practice is included in the same semester to ensure contiguity and give an opportunity for the students to reinforce their theoretical knowledge by practically verifying in the laboratory. care has been taken to match the Experiments with field requirements.

TIME SCHEDULE

S. No.	EXPERIMENTS	No. of Periods
1.	Practice with Microcontroller Kit	06
2.	Practice Instruction set	12
3.	**Data transfer instructions**	9
4	**Data Manipulation**	6
5	**Practice Boolean & Logical instructions :**	6
6	**implement Counters ,Timers Interrupts and Flags**	3
7	**VIII. Use 8051 Interrupts and Flags**	3
8	Total	45

LIST OF EXPERIMENTS

I. Familiarization with Microcontroller Kit & Simulators (Not for End Examination)

1. Practice with microcontroller kits and Simulators

a) Familiarize with 8051 Microcontroller Kit

b) Familiarize with 8051 simulator EDSIM 51 (or similar)

c) Write small ALP to verify different register addressing techniques

II . 8051 Instruction set

1. Practice **Arithmetic instructions of 8051**

a) Write an ALP to demonstrate Addition , subtraction , division and multiplication of 8 bit numbers using immediate data access.

2 . Write an ALP to Add and Subtract 16 bit numbers

3. Write an ALP to find the Square and Cube of a decimal number

4. Write an ALP to find LCM of given 3 decimal numbers

b) Write an ALP To find HCF of given 3 decimal numbers

III . Practice **Data transfer instructions**

5 Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X40-0X49 (without overlap)

6. Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X35-0X39 (with overlap)

7. Write an ALP to Block exchange – 10bytes of data between 0X30-0X39 to 0X40-0X49

8. Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X1000-0X1009 (Internal to external memory or vice versa)

V. Practice Data Manipulation

9. Find Smallest/Largest number in 10bytes of data from 0X30-0X39 (R3 – should store the smallest/largest number and R4 – should store address of the smallest/largest number)

b). Search for an element in the 10 bytes of data from 0X30-0X39 (R3 =1, if element is found else R3=0)

10. Sort 10bytes of data from 0X30-0X39 in Ascending order

b) Sort 10bytes of data from 0X30-0X39 in Descending order

VI . Practice Boolean & Logical instructions :

11. Write the programs given below

a) Find 2's complement of a number using (CPL) instruction

b) Convert Packed to Unpacked BCD (bit Masking) Using (ANL) Instruction

12. Convert ASCII to BCD Using(XRL) instruction.

VI. implement Counters ,Timers Interrupts and Flags

13. Implement a HEX up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter)

a) implement BCD(00-99) up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter)

VII. Implement Delays and Timers

14. a) Write a program in assembly language to produce required time delay a) by Using instructions only b) by Using Timers

15. Write a program in assembly language to verify Logical or Delay loop using Call and return instructions

VIII. Use 8051 Interrupts and Flags

16. Write a program to generate a square wave of 50 Hz on pin 1.2 . Assume that crystal frequency is 11.0592 MHz using timer.

Competencies and Key Competencies

Exp No	Name of the Experiment (No of Periods)	Competencies	Key Competencies
1	To practice with microcontroller kits and Simulators (3) a) To Familiarize with 8051 Microcontroller Kit b) To Familiarize with 8051 simulator EDSIM 51 (or similar) c) To Write small ALP to	➢ Identify the component assemblies in the kit ➢ Enter the ALP at the specified address and execute ➢ Use the simulator for the same ALP and verify the register	▪ Enter the ALP at the specified address and execute ▪ Use the simulator for the same ALP and verify the register contents and the Flags

	verify different register addressing techniques	contents and the Flags	
2	To Practice Arithmetic instructions of 8051 (3) a) Write an ALP to demonstrate Addition , subtraction , division and multiplication of 8 bit numbers using immediate data access.	➢ Enter the ALP at the specified address and execute ➢ Use Arithmetic Instructions ➢ Use the simulator for the same ALP and verify the register contents	▪ Enter the ALP at the specified address and execute ▪ Use Arithmetic Instructions ▪ Use the simulator for the same ALP and verify the register contents
3	b) Write an ALP to Add and Subtract 16 bit numbers c)	➢ Enter the ALP at the specified address and execute ➢ Use Arithmetic Instructions ➢ Use the simulator for the same ALP and verify the register contents	▪ Enter the ALP at the specified address and execute ▪ Use Arithmetic Instructions ▪ Use the simulator for the same ALP and verify the register contents
4	Write an ALP to find the Square and Cube of a decimal number	➢ Enter the ALP at the specified address and execute ➢ Use Arithmetic Instructions ➢ Use the simulator for the same ALP and verify the register contents	▪ Enter the ALP at the specified address and execute ▪ Use Arithmetic Instructions ▪ Use the simulator for the same ALP and verify the register contents
5	Write an ALP to find LCM of given 3 decimal numbers b) Write an ALP To find HCF	➢ Enter the ALP at the specified address and execute	▪ Enter the ALP at the specified address and execute

	of given 3 decimal numbers	➢ Use Arithmetic Instructions ➢ Use the simulator for the same ALP and verify the register contents	▪ Use Arithmetic Instructions ▪ Use the simulator for the same ALP and verify the register contents
6	To Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X40-0X49 (without overlap) (3)	➢ Enter the ALP at the specified address and execute ➢ Use DATA Transfer Instructions ➢ Use the simulator for the same ALP and verify the Memory contents	▪ Enter the ALP at the specified address and execute ▪ Use Arithmetic Instructions ▪ Use the simulator for the same ALP and verify the register contents
7	a) Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X35-0X39 (with overlap)	➢ Enter the ALP at the specified address and execute ➢ Use DATA Transfer Instructions ➢ Use the simulator for the same ALP and verify the Memory contents	▪ Enter the ALP at the specified address and execute ▪ Use Arithmetic Instructions ▪ Use the simulator for the same ALP and verify the register contents
8	Write an ALP to Block exchange – 10bytes of data between 0X30-0X39 to 0X40-0X49	➢ Enter the ALP at the specified address and execute ➢ Use DATA Transfer Instructions ➢ Use the simulator for the same ALP and verify the Memory contents	▪ Enter the ALP at the specified address and execute ▪ Use Arithmetic Instructions ▪ Use the simulator for the same ALP and verify the register contents

9	Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X1000-0X1009 (Internal to external memory or vice versa)	➢ Enter the ALP at the specified address and execute ➢ Use DATA Transfer Instructions ➢ Use the simulator for the same ALP and verify the Memory contents	▪ Enter the ALP at the specified address and execute ▪ Use Arithmetic Instructions ▪ Use the simulator for the same ALP and verify the register contents
10	To Practice Data Manipulation (3) a) To find Smallest/Largest number in 10bytes of data from 0X30-0X39 (R3 – should store the smallest/largest number and R4 – should store address of the smallest/largest number) b) To Search for an element in the 10 bytes of data from 0X30-0X39 (R3 =1, if element is found else R3=0)	➢ Enter the ALP at the specified address and execute ➢ Use Logical Instructions ➢ Use the simulator for the same ALP and verify the result	▪ Enter the ALP at the specified address and execute ▪ Use Arithmetic Instructions ▪ Use the simulator for the same ALP and verify the register contents
11	a) To Sort 10bytes of data from 0X30-0X39 in Ascending order b) To Sort 10bytes of data from 0X30-0X39 in Descending order	➢ Enter the ALP at the specified address and execute ➢ Use Logical Instructions ➢ Use the simulator for the same ALP and verify the result	▪ Enter the ALP at the specified address and execute ▪ Use Arithmetic Instructions ▪ Use the simulator for the same ALP and verify the register

			contents
12	To Find 2's complement of a number using (CPL) instruction (3) a) To Convert Packed to Unpacked BCD (bit Masking) Using (ANL) Instruction	➢ Enter the ALP at the specified address and execute ➢ Use CPL Instructions ➢ Use the simulator for the same ALP and verify the result	▪ Enter the ALP at the specified address and execute ▪ Use CPL instruction ▪ Use the simulator for the same ALP and verify the register contents
13	a) To convert Unpacked BCD to ASCII Using (ORL) instruction. b) To Convert ASCII to BCD Using(XRL) instruction. ➢	➢ Enter the ALP at the specified address and execute ➢ Use ORL & XRL Instructions ➢ Use the simulator for the same ALP and verify the result	▪ Enter the ALP at the specified address and execute ▪ Use ORL & XRL instruction ▪ Use the simulator for the same ALP and verify the register contents
14	To implement a HEX up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter) (3) b) To implement BCD(00-99)	➢ Enter the ALP at the specified address and execute ➢ Use timer/Counter	▪ Enter the ALP at the specified address and execute ▪ Use timer/Counter

	up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter)		
15	15. a) Write a program in assembly language to produce required time delay a) by Using instructions only b) by Using Timers b. Write a program in assembly language to verify Logical or Delay loop using Call and return instructions	➢ Enter the ALP at the specified address and execute ➢ Use timer/Counter ➢ Use CALL and RET Instructions ➢ Verify STACK Contents in the Simulator	▪ Enter the ALP at the specified address and execute ▪ Use timer/Counter ▪ Use CALL and RET Instructions ▪ Verify STACK Contents in the Simulator
16	16. Write a program to generate a square wave of 50 Hz on pin 1.2 . Assume that crystal frequency is 11.0592 MHz using timer.	➢ Enter the ALP at the specified address ➢ Calculate the ➢ Timer Data to be loaded for 50 Hz ➢ Execute the Program	▪ Enter the ALP at the specified address ▪ Calculate the Timer Data to be loaded for 50 Hz Execute the Program

Programming in C LAB Practice

Subject Title : Programming in C LAB Practice
Subject Code : EC- 410
Periods/Week : 03
Periods/Semester : 45

Rationale ; Programming with C is introduced to reinforce the programming skills learnt in the class Room

TIME SCHEDULE

Sl	Major Topic	No. of Periods
1	C Programming Basics	9
2	Decision & Loop Control Statements	9
3	Exercises on functions	3
4	Arrays, Strings and Pointers in C	12
5	Structures, Unions & Preprocessor Directives	12
		45

LIST OF EXPERIMENTS

I. C Programming Basics

1. familiarize with turbo Compiler features.
2. T practice formatted Input /Outpt (printf and scanf) functions.
3. Practice with Various Operators in C

II. Decision & Loop Control Statements

4. practice with Decision & Control (if, if-else, nested if –else) Statements
5. practice with Decision control (Switch –case structure) statements

6. practice with loop control Statements

III. Exercises on functions

7. practice the use of functions in C

IV. Arrays, Strings and Pointers in C

8. practice single dimensional integer arrays

9. practice multidimensional integer arrays .

10. Practice string functions for string comparison , copying and concatenation

11. practice with pointers in 'C'

V. Structures, Unions & Preprocessor Directives

12. practice the use of Structures in C

13. practice with C preprocessor Directives.

14. practice command line arguments in C

Competencies and Key Competencies to be achieved

Exp No	Name of the Experiment (No of periods)	Competencies	Key Competencies
1	To practice with turbo C Compiler features.(1)	➢ Enter the program in standard format following syntax in text editor ➢ debug and Compile ➢ Execute and save with appropriate name	▪ Enter the program in standard format following syntax in text editor ▪ debug and Compile ▪ Execute and save with appropriate name
2	To practice formatted	➢ Enter the program in	▪ Handle string data and

	Input /Outpt (printf and scanf) functions.(2)	standard format following syntax in text editor ➢ Handle string data and Numerical data ➢ Use format modifiers for printf and scanf ➢ debug and Compile ➢ Execute and save with appropriate name	Numerical data ▪ Use format modifiers for printf and scanf ▪ debug and Compile ▪ Execute and save with appropriate name
3	To Practice with Various Operators inC(3)	➢ Enter the program in standard format following syntax in text editor ➢ Use assignment operators, Arithmetic operators, precedence operators , Relational &logical operators ➢ debug and Compile ➢ Execute and save with appropriate name	▪ Use assignment operators, Arithmetic operators, precedence operators , Relational &logical operators ▪ debug and Compile ▪ Execute and save with appropriate name
4	To practice with Decision & Control (if, if-else, nested if –else) Statements (3)	➢ Enter the program in standard format following syntax in text editor ➢ Use If statements and its variants, ➢ debug and Compile ➢ Execute and save with appropriate name	▪ Use If statements and its variants, Switch statement, iteration constructs, Jump &exit statements ▪ debug and Compile
5	To practice with	➢ Enter the program in	▪ Use Switch statement,

	Decision control (Switch –case structure) statements(3)	standard format following syntax in text editor ➢ Use Switch statement, ➢ debug and Compile ➢ Execute and save with appropriate name	
6	To practice with loop control Statements(3)	➢ Enter the program in standard format following syntax in text editor ➢ Use , iteration constructs, Jump &exit statements ➢ debug and Compile ➢ Execute and save with appropriate name	▪ Use , iteration constructs, Jump &exit statements
7	To practice the use of functions in C (6)	➢ Enter the program in standard format following syntax in text editor ➢ Function declaration ➢ Declare local variables, formal parameters &Global variables ➢ Use Calling by value ➢ Use Calling by reference ➢ Use nesting of function calls ➢ Debug and Compile ➢ Execute and save with appropriate name	▪ Function declaration ▪ Declare local variables, formal parameters &Global variables ▪ Use Calling by value ▪ Use Calling by reference ▪ Use nesting of function calls

8	To practice the use of Recursive functions in C (6)	➢ Enter the program in standard format following syntax in text editor ➢ Function declaration ➢ Declare local variables, formal parameters &Global variables ➢ Use Recursion ➢ Return from main ➢ Declare variable number &type for arguments ➢ Debug and Compile ➢ Execute and save with appropriate name	▪ Declare local variables, formal parameters &Global variables ▪ Use Recursion ▪ Return from main ▪ Declare variable number &type for arguments
9	To practice single dimensional integer arrays(3)	➢ Enter the program in standard format following syntax in text editor ➢ Define array ➢ Use Array initialization ➢ Read unknown number of elements ➢ Debug and Compile ➢ Execute and save with appropriate name	▪ Define array ▪ Use Array initialization ▪ Read unknown number of elements ▪ Debug and Compile ▪ Execute and save with appropriate name
10	To practice multidimensional integer arrays(3)	➢ Enter the program in standard format following syntax in text editor ➢ Define 2 dimensional array	▪ Define 2 dimensional array ▪ Use Array initialization ▪ Use arrays as

		➢ Use Array initialization ➢ Use arrays as arguments in functions ➢ Debug and Compile ➢ Execute and save with appropriate name	arguments in functions
11	To Practice string functions for string comparison , copying and concatenation(3)	➢ Enter the program in standard format following syntax in text editor ➢ Use strcmp, str ➢ Use arrays as arguments in functions ➢ Debug and Compile ➢ Execute and save with appropriate name	▪ Use strcmp, strcpy,strcnt functions ▪ Debug and Compile ▪ Execute and save with appropriate name
12	To practice with pointers in 'C'(3)	➢ Enter the program in standard format following syntax in text editor ➢ Declare pointer variables ➢ Use pointer operators ➢ Comparing pointers ➢ Debug and Compile ➢ Execute and save with appropriate name	▪ Declare pointer variables ▪ Use pointer operators ▪ Comparing pointers ▪ Debug and Compile
13	To practice the use of Structures in C(3)	➢ Enter the program in standard format following syntax in text editor	▪ Define structure ▪ Give assignment statement

		➢ Define structure ➢ Give assignment statement ➢ Initialization of structure array ➢ Debug and Compile ➢ Execute and save with appropriate name	▪ Initialization of structure array ▪ Debug and Compile
14	To practice with C preprocessor Directives.(6)	➢ Enter the program in standard format following syntax in text editor ➢ Use #define, #if, #ifdef, #else, #elif, #include pre-processor directives in the program ➢ Debug and Compile ➢ Execute and save with appropriate name	▪ Use #define, #if, #ifdef, #else, #elif, #include pre-processor directives in the program

V SEMESTER

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING

C-16 SCHEME OF INSTRUCTION AND EXAMINATIONS

v SEMESTER

Subject Code	Name of the subject	Institution periods/week		Total periods/year	Scheme of Examination			
		Theory	Practical		Duration(Hours)	Sessional marks	End exam marks	Total marks
THEORY SUBJECTS								
EC-501	Industrial Management & Entrepreneurship	5		75	3	20	80	100
EC-502	Industrial Electronics	5		75	3	20	80	100
EC-503	Consumer Electronics	4		60	3	20	80	100
EC-504	Data Communication & Computer Networking	5		75	3	20	80	100
EC-505	Microcontroller Interfacing & Applications	5		75	3	20	80	100
EC-506	a) Mobile and Optical fiber communication b) Basics of VLSI Circuits	5		75	3	20	80	100
PRACTICAL SUBJECTS								
EC-507	Industrial Electronics Lab		3	45	3	40	60	100
EC-508	Data Communication &Hardware Lab Practice		3	45	3	40	60	100
EC-509	Microcontrollers applications lab Practice		3	45	3	40	60	100
EC-510	Project work		4	60	3	40	60	100
	Total	29	13	630		280	720	1000

INDUSTRIAL MANAGEMENT & ENTREPRENEURSHIP

Subject Title : Industrial Management & Entrepreneurship
Subject Code : EC-501
Periods/Week : 05
Periods/semester : 75

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of marks	Short questions	Essay questions
1.	Overview Of Business	4	13	1	1
2.	Management & Organization	12	2	2	1
3.	Human Resource Management	12	13	1	1
4.	Financial Management	10	16	2	1
5.	Materials Management	8	13	1	1
6.	Project Management	14	13	1	1
7	Entrepreneurship &Supporting Institutions	15	26	2	2
	Total	75	110	10	8

OBJECTIVES

Upon completion of the course the student should be able to

1.0 Explain the basics of Business

1.1 Define Business

1.2 State the Types of Business (Service, Manufacturing, Trade)

1.3 Explain the business procedures in Engineering sector (Process industry, Textile industry, Chemical industry, Agro industry,)

1.4 State the need for Globalization.

1.5 List the Advantages & Disadvantages of globalization w.r.t. India.

1.6 Explain the importance of Intellectual Property Rights (I.P.R.)

2.0 Understand the management & Organization

2.1 Define Management.

2.2 Explain the concept of management

2.3 Explain the Different Levels of management

2.4 Explain Administration & management

2.5 State the principles of Scientific management by F.W.Taylor

2.6 State the principles of Management by Henry Fayol (14 principles)

2.7 List the Functions of Management

i) Planning ii) Organizing iii) Directing iv) Controlling

2.8 Explain the four Functions of Management.

2.9 Define Organization

2.10 List the Types of organization :a) Line b) Line & staff c) Functional d) Project

2.11 Explain the four types of organization.

2.12 Define departmentatization.

2.13 Explain the following types of departmentalizations

i) Centralized & Decentralized ii) Authority & Responsibility iii) Span of Control

2.14 Explain the Forms of ownership

i)Proprietorship ii) Partnership iii) Joint stock iv) Co-operative Society v)Govt. Sector

3.0 Understand the need for Human Resource Management

3.1 Define Personal Management.

3.2 Explain the functions of Personal Management

3.3 Define Staffing .

3.4 State the importance of HR Planning.

3.5 Explain the various Recruitment Procedures.

3.6 Explain the need for Training & Development .

3.7 State the various types of training procedures(Induction, Skill Enhancement etc)

3.8 State the different types of Leaderships,

3.9 Explain the Maslow's Theory of Motivation

3.10 Explain the Causes of accident and the Safety precautions to be followed.

3.11 Explain the importance of various Acts – Factory Act, ESI Act, Workmen Compensation Act, Industrial Dispute Act etc.

4.0 Understand the basics of Financial Management

4.1 State the Objectives of Financial Management.

4.2 State the Functions of Financial Management.

4.3. State the necessity of Capital Generation & Management.

4.4 List the types of Capitals.

4.5 List the Sources of raising Capital.

4.6 Explain the Types of Budgets

i) Production Budget (including Variance Report) ii) Labour Budget.

4.7 Explain Profit & Loss Account (only concepts) .

4.8 Explain the proforma of Balance Sheet.

4.9 Explain i) Excise Tax ii) Service Tax iii) Income Tax iv) VAT v) Custom Duty.

5.0 Understand the importance of Materials Management

5.1. Define Inventory Management (No Numerical).

5.2 State the objectives of Inventory Management.

5.3 Explain ABC Analysis.

5.4 State Economic Order Quantity.

5.5 Explain the Graphical Representation of Economic Order Quantity.

5.6 State the objectives of Purchasing.

5.7 State the functions of Purchase Department.

5.8 Explain the steps involved in Purchasing.

5.9 State the Modern Techniques of Material Management.

5.10 Explain the JIT / SAP / ERP packages.

6.0 Understand the importance of Project Management

6.1 State the meaning of Project Management.

6.2 Explain the CPM & PERT Techniques of Project Management.

6.3 Identify the critical path and find the project duration.

6.4 Explain the concept of Break Even Analysis

6.5 Define Quality.

6.6 State the concept of Quality.

6.7 Explain the various Quality Management systems.

6.8 Explain the importance of Quality policy, Quality control, Quality Circle.

6.9 State the principles of Quality Assurance.

6.10 State the concepts of TQM , Kaizen 5's and 6 sigma.

6.11 State the constituents of ISO 9000 series standards.

7.0. Understand Entrepreneurship and supporting Institutions

7.1. Explain the concept of entrepreneurship

7.2. Mention the qualities of entrepreneur

7.3. Distinguish between manager-entrepreneur and technical entrepreneur

7.4. Mention the advantages of being an entrepreneur

7.5. List the functions of entrepreneur

7.6. Mention the important types of entrepreneur and their meaning

7.7. Explain the role of entrepreneurship in economic development

7.8. Mention the barriers to entrepreneurship

7.9. Mention different types of Industries

7.10. Define Small scale industry

7.11. List the features of SSI

7.12. Mention the objectives of developing SSIs

7.13. Explain the scope of SSI in terms of various activities

7.14. List the merits of SSIs

7.15. Explain the important steps involved in starting an SSI

7.16. Define a start up company

7.17. Explain various start up development phases

7.18. Name the state level and National level sources of information

7.19. Mention the various Central government institutions and their functions (like NSIC , SIDO, SISI_SSIB)

7.20. Explain Telagana state industry policy
7.21. Mention the demographic merits of Telangana state to set up SSIs
7.22. Mention the names of State level institutions and their functions (like SSIDC, DIC, APITCO)
7.23. List the banks that support SSIs like SIDBI, APSFC,
7.24. List the thrust areas and Core sectors as per Telangana state industry policy
7.25. Classify the projects as per TSIP
7.26. Mention Special assistance schemes for women and SC/ST entrepreneurs
7.27. Mention the features of TS-iPASS

COURSE CONTENT

1.0 Overview of Business:

Business - types of business in various sectors- service, manufacturing & trade- Industrial sectors – Engineering, process, Textile, Chemical, Agro industries – Globalization and effect of globalization – advantages and Disadvantages- Intellectual Property Rights (I.P.R.)

2.0 Management process

Concept of management – levels of management – Scientific management – by FW Taylor – Principles of management- functions of management – Administration – management. -Organization – types of organization(line, line & staff, staff & project) – Departmentation – Classification (centralized, decentralized, Authority, Responsibility, and span of control – Forms of Ownership – Proprietorship – Partnership – Joint stock – Co-operative society and Government sectors.

3.0 Human resource Management

Personal Management – Staffing – Introduction to HR planning – Recruitment procedures – Types of Trainings –Personal training – skill development training – Leaderships – types – Motivation – Maslows theory – Causes of accidents – safety precautions – Factory Act – Workmen compensation Act – Industrial disputes Act- ESI Act.

4.0 Finance Management

Introduction – Objectives of Financial Management – Types of capitals – sources of raising capital – Types of budgets – production budgets – labour budgets – Concept of

Profit loss Account – Concept of balance sheet – proforma – types of taxes – brief concepts of – Excise Tax, Service Tax, Income Tax, VAT and custom duty.

5.0 Material Management

Inventory Management – objectives of Inventory Management – ABC Analysis – Economic order Quality – Purchasing – Objectives of purchasing – Functions – Procedures – Material Management - JIT / SAP / ERP.

6.0 Project Management

Introduction – CPM & PERT – concept of Break event Analysis – quality system - Definition of Quality , concept of Quality , Quality policy, Quality control, Quality Circle, Quality Assurance, Introduction to TQM- Kaizen 5's and 6 sigma concepts, ISO 9000 series standards.

7.0 Entrepreneurship and Supporting Institutions

Qualities of entrepreneur- Manager-entrepreneur and technical entrepreneur- Advantages of being an entrepreneur- Functions of-entrepreneur- Types of entrepreneur and their meaning- Role of entrepreneurship in economic development- Barriers to entrepreneurship-Mention different types of industries –Definition of small scale industry- Features of ssi-Mention the objectives of developing SSIs- Scope of SSI in terms of various activities- merits ofSSIs-explain the important steps involved in starting an ssi- definition of startup company- Start up development phases- State level and National level sources of information- Various central government institutions and their functions (like NSIC , SIDO, SISI_SSIB)- Telagana state industry policy- Demographic merits of Telangana state to set up SSIs- Names of state level institutions and their functions (like SSIDC, DIC, APITCO)- Banks that support SSIs like SIDBI, APSFC- thrust areas and core sectors as per telangana state industry policy-classification of the projects as per TSIP- Special assistance schemes for women and SC/ST entrepreneurs- Features of TS-IPASS

REFERENCE BOOKS:

1. Industrial Engg &Management by Dr. O.P. Khanna - Dhanpath Rai & sons New Delhi
2. Business Administration &Management Dr. S.C. Saxena & W.H. Newman& E.Kirby Warren- Sahitya Bhavan Agra
3. The process of Management by Andrew R. McGill - Prentice Hall
4. Industrial Management by Rustom S. Davar - Khanna Publication

INDUSTRIAL ELECTRONICS

Subject Title : Industrial Electronics
Subject Code : EC-502
Periods/Week : 05
Periods/Semester : 75

Rationale: Industrial Electronics subject is included in the VI semester to make the students understand the applications of Electronic principles they have learnt in the previous semesters. This course will no doubt, make the students feel confident to face the interviews and work in the field when they join the industries.

TIME SCHEDULE

Sl	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Power Electronic Devices	20	26	2	2
2	Transducers & Ultrasonics	15	26	2	2
3	Industrial heating & Welding	10	21	2	1 ½
4	PLC & Programming	15	21	2	1 ½
5	Control Engg	15	16	2	1
	Total	**75**	**110**	**10**	**8**

OBJECTIVES

Upon completion of this course a student should be able to

1.0 Understand the construction and working of Power Electronic Devices

1.1 List different thyristor family devices.

1.2 Sketch the circuit symbols for each device.

1.3 Explain constructional details of SCR.

1.4 Explain the working of SCR using two Transistor analogy.

1.5 Explain the Volt-Ampere characteristics of SCR.

1.6 Mention the important ratings of SCR.

1.7 Define *forward break over voltage, latching current, holding current, turn on triggering time, turn off time* of SCR.

1.8 Distinguish between SUS, SBS, SCS & LASCR

1.9 Explain SCR circuit triggering by UJT with a circuit diagram.

1.10 Draw input and Output waveforms for the above circuit with Resistive load

1.11 Mention the use of SCR in single phase and three phase Power rectifiers.

1.12 Explain the construction of Diac.

1.13 Explain the Volt-ampere characteristics of Diac

1.14 Explain the construction of Triac.

1.15 Explain the Volt-ampere characteristics of Triac.

1.16 Explain different modes of Triac triggering.

1.17 Explain the Phase control circuit using Diac and Triac for AC power control.

1.18 Draw the input and output waveforms.

1.19 Mention the differences between BJT and Power BJT.

1.20 Explain the working of Insulated gate Bipolar transistor (IGBT),

1.21 Explain the need for protection of power devices(snubber circuit).

1.22 Give important specifications of power electronic devices from Manufacturer's data sheet .

1.23 List the six important applications of power electronic devices.

1.24 Explain the working of MOSFET based Inverter circuit.

1.25 With a block diagram explain the working of a) Off Line UPS b) Online UPS

1.26 Explain PWM Voltage control of UPS

1.27 Explain the limitations of series Voltage regulated power supplies

1.28 Explain the working of SMPS with block diagram

1.29 Mention any 3 applications of SMPS

1.30 Explain the working of Servo stabilizer

2.0 Understand the working of transducers and Ultrasonics

2.1 Classify transducers on the basis of principle of operation and applications.

2.2 Explain the working principle, construction and applications of strain gauge.

2.3 Explain the working principle, construction and applications of potentiometric transducer.

2.4 Explain the working principle, construction of capacitive and inductive transducers.

2.5 Mention the 6 important applications of above transducers.

2.6 Explain the working principle, construction and applications of LVDT.

2.7 Explain the working principle and construction of Piezo electric transducer.

2.8 List any 3 uses for the Piezo electric transducer

2.9 Explain the working principle of RTD & Thermocouple transducer.

2.10 Mention the 6 important applications of above transducers.

2.11 Explain the application of transducer in Accelerometer, servomotors, and Tachogenerators.

2.12 Explain the term Ultrasonic.

2.13 Mention methods of generating ultrasonic waves.

2.14 Draw and explain pulsed-echo ultrasonic flaw detector

2.15 Explain the principle of MEMS devices

2.16 Mention their use in modern smart phones and other devices

3.0 Industrial Heating & welding

3.1 Classify industrial heating methods.

3.2 Explain the principle of induction heating.

3.3 List four applications of induction heating.

3.4 Draw the circuit of HF power source for induction heating and explain its working.

3.5 Explain the principle of dielectric heating.

3.6 Explain the electrodes used in dielectric heating & method of coupling to RF generator.

3.7 Mention the applications of dielectric heating.

3.8 Define welding.

3.9 List 4 types of Electrical welding

3.10 Explain the principle of resistive welding.

3.11 Draw the basic circuit of AC resistive welding and explain its working.

3.12 Mention applications of resistive welding.

3.13 Mention the applications of other welding Techniques

4.0 Understand architecture of PLCs & Programming

4.1 Explain the need for PLC

4.2 Explain the basic principle of PLCs.

4.3 Explain the power supply module, CPU, Bus unit, and I/O Module, Interfacing Module and programmer module.
4.4 Explain the PLC scan cycle.
4.5 Give the ladder logic symbols.
4.6 Explain the meaning of above symbols
4.7 Explain the Ladder diagrams
4.8 Explain the use of statement list .
4.9 Explain control systems flow charts.
4.10 Write simple Ladder program using bit instructions Timer instructions and counter instructions
4.11 List types of PLCs.
4.12 List the features of popular PLCs like Siemens , Allenbradly .
4.13 List any 4 applications of PLCS in the industry.

5.0 Control Engineering

5.1 Define system and Control system.
5.2 Classify control systems
5.3 Explain the basic block diagram of control system
5.4 Explain an open loop control system.
5.5 Give examples for open loop control system.
5.6 Give three merits and demerits of open loop control.
5.7 Explain the closed loop system with the help of a block diagram.
5.8 Give Examples for closed loop system
5.9 Compare Open loop and closed loop control systems.
5.10 Define Transfer function
5.11 Explain the use of Laplace transforms in control systems

COURSE CONTENT

1. Power Electronic Devices - Different thyristor family devices- circuit symbols - Constructional details of SCR- Working of SCR using two Transistor analogy- Volt-Ampere characteristics of SCR- Ratings of SCR- forward break over voltage, latching current, holding current, turn on triggering time, turn off time of SCR- -Compare the characteristics of GTO SCR and SCR- Constructional details of Diac & Triac- Volt-ampere characteristics of Diac & Triac under forward/Reverse bias- Different modes of Triac triggering- SUS, SBS, SCS & LASCR-

SCR circuit triggering by UJT - input and Output waveforms- Use of SCR in single phase and three phase Power rectifiers- Construction of Diac- Volt-ampere characteristics of Diac - Construction of Triac- Volt-ampere characteristics of Triac- Different modes of Triac triggering- Phase control circuit using Diac and Triac for AC power control- input and output waveforms- Differences between BJT and Power BJT-BJT, MOS-Controlled thyristors (MCT) with characteristics- Working of Insulated gate Bipolar transistor (IGBT)- Need for protection of power devices- Important specifications of power electronic devices from Manufacturer's data sheet - Important applications of power electronic devices- Working of MOSFET based Inverter circuit-With a block diagram explain the working of a) Off Line UPS b) Online UPS- PWM Voltage control of UPS- Limitations of series Voltage regulated power supplies- Working of SMPS with block diagram- Applications of SMPS- Working of Servo stabilizer .

2. **Transducers & Ultrasonics**

Classification of transducers on the basis of principle of operation and applications- Working principle, construction and applications of strain gauge- Working principle, construction and applications of potentiometric transducer- Working principle, construction of capacitive and inductive transducers- Important applications of transducers- Working principle, construction and applications of LVDT- Working principle and construction of Piezo electric transducer-Uses for the Piezo electric transducer- Working principle of RTD & Thermocouple transducer- Important applications of above transducers- Application of transducer in Accelerometer, servomotors, and Tachogenerators-Methods of generating ultrasonic waves-Draw and explain pulsed-echo ultrasonic flaw detector- Principle of MEMS devices- Their uses in modern smart phones and other devices.

3. **Induction heating, Dielectric heating and Resistance welding**-Industrial heating methods- Principle of induction heating- Applications of induction heating-HF power source for induction heating - Principle of dielectric heating- Electrodes used in dielectric heating & method of coupling to RF generator- Applications of dielectric heating. Welding- types of Electrical welding- Principle of resistive welding- Circuit of AC resistive welding - Applications of resistive welding- Other welding Techniques.

4. **PLCs & Programming-**Need for PLC and its programming- Basic principle of PLCs- Power supply module, CPU, Bus unit, and I/O Module, Interfacing Module and programmer module- PLC scan cycle- Ladder logic symbols- Meaning of above symbols- Current flow

(Forward and Reverse current)-Ladder diagrams-Uses of statement list- Control systems flow charts-Ladder program using bit instructions, timer instructions and counter instructions-Types of PLCs-Features of popular PLCs like Siemens, Allenbradly -Applications of PLCS in the industry-Relay logic control panel – PLC based control panel - Architecture of PLC.

5. **Control Engineering-** Definition of the System and Control system and its classification-Basic block diagram of control system-Open loop control system with examples-Merits and demerits of open loop control-Closed loop system with the help of a block diagram- Examples for closed loop system-Comparison of Open and closed loop control systems- Transfer function-Uses of Laplace transforms in control systems.

REFERENCE BOOKS:

1. Power Electronics by P.C.Sen Tata McGraw-Hill Education
2. Industrial Electronics and Control by S.K.Bhattacharya, S.Chatterjee TTTI Chandigarh –TES
3. Industrial And Power Electronics (Paperback) By: G. K. Mithal (Author) | Khanna Publishers
4. Control Systems Engineering by I. J. Nagrath And M. Gopal New Age Publisher, New Delhi
5. PLCs & SCADA : Theory and Practice by Rajesh Mehra, Vikrant Vij - Laxmi Publications

CONSUMER ELECTRONICS

Subject Title : Consumer Electronics
Subject Code : EC-503
Periods/Week : 04
Periods/Semester : 60

Rationale: Consumer Electronics Subject is introduced to meet the needs of consumer electronics Industry. The units in the course are designed to impart the concepts of Audio Video systems, Television, Cable TV, DTH services and other domestic appliances like Microwave ovens and Automatic washing Machines.

TIME SCHEDULE

Sl.	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Audio Systems	12	21	2	2
2	TV Picture & Composite Video Signal	12	13	2	1
3	Colour Television	12	23	2	2
4	Cable, Satellite and digital TV	12	21	2	2
5	Domestic Appliances	12	16	2	1
	Total	**60**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student should be able to

1.0 Understand Audio Systems

1.1 Define speech, music and noise.

1.2 Explain frequency response and equalization.

1.3 Define the concept of Hi-Fi and Stereo.

1.4 State the need of bass, treble, balance, and volume control in stereo amplifier.

1.5 Explain a simple circuit showing the above controls.

1.6 Explain the principle of magnetic recording and reproduction.

1.7 List five advantages and disadvantages magnetic recording.

1.8 State the principle of optical recording.

1.9 Explain the method of optical recording of sound on film

1.10 Explain the working of DVD player with block diagram.

1.11 Explain MP3 & MP4 formats.

1.12 Explain the concept of noise reduction using DOLBY system.

1.13 Explain home theatre sound system.

1.14 Explain the speaker arrangement and features of Dolby Digital 5.1 Surround Sound (AC3)

2.0 Comprehend TV Picture & Composite video signal

2.1 Explain formation of picture.

2.2 State the need for horizontal and vertical scanning.

2.3 State the frame and field frequencies.

2.4 State need for vertical synchronisation, horizontal synchronisation and blanking pulses.

2.5 Mention the frequency allocation of T.V. Channels used in India.

2.6 Mention Important standards of T.V. transmissions as per C.C.I.R.

2.7 List different types of scanning

2.8 Distinguish between progressive and interlaced scanning.

2.9 Draw the standard scanning pattern in an interlaced scanning.

2.10 State the need for interlaced scanning with reference to Bandwidth.

2.11 List all different pulses in a composite video signal.

2.12 State and compare positive and negative modulation.

2.13 Sketch composite video signal as per I.S.I. specification.

2.14 State the need for front porch and back porch in blanking pulses.

2.15 State the necessity of equalising pulses and serrated vertical blanking pulses.

3.0 Understand the working of Colour Television.

3.1 Explain the main characteristic of human eye with regard to perception of colours.

3.2 Distinguish between additive and subtractive mixing of colours.

3.3 Explain complementary colours, hue, saturation, and Colour circle.

3.4 Explain compatibility in TV system.

3.5 List three standards of Colour transmission system NTSC, PAL and SECAM.

3.6 Explain how chrominance signals are transmitted on one carrier in PAL system.

3.7 Draw the block diagram of a Colour TV transmitter and state the function of each block.

3.8 Draw the block diagram of a Colour TV receiver and state the function of each block.

3.9 Explain the processing of Colour video signal (PAL system) in a Colour receiver.

3.10 Mention different types (like Plasma ,LCD,LED,OLED) of Colour TV monitors

3.11 Explain the basic principles of above technologies

4.0 Understand the principles of Cable, Satellite and Smart TV

4.1 Draw and explain the block diagram of CATV.

4.2 Explain the cable TV components such as amplifiers directional couplers and Converters.

4.3 Explain the necessity of mid-band and super-band channels

4.4 State the need for satellite for TV broadcasting over wide area.

4.5 Explain the merits of DTH system

4.6 With a block diagram explain DVB-S channel reception with block diagram.

4.7 State the need for Set Top Box.

4.8 List main features of Projection TV

4.9 List applications of Projection TV

4.10 Explain the features of HDTV

4.11 Explain the features of SMART TV.

4.12 List the important specifications of UHD TV

5.0 Understand the working of Domestic Appliances

5.1 Explain the working principle of Microwave oven

5.2 Explain functional block diagram of Microwave oven

5.3 List 3 advantages of Microwave oven

5.4 Explain the principle of Induction heater.

5.5 Give the reasons for using magnetic metals for use with induction heater.

5.6 List the 4 merits of induction heating.

5.7 Explain the functional block diagram of Electronic Washing machine

5.8 List any three advantages of Fuzzy logic in washing machines

5.9 Explain functional block diagram of Camcorder

5.10 List the applications of Camcorder

COURSE CONTENT

1. Audio Systems: Speech, music and noise-Frequency response and equalization-Concept of Hi-Fi and Stereo-Need of bass, treble, balance, and volume control in stereo amplifier-Simple circuit showing the above controls-Principle of magnetic recording and reproduction-Advantages and disadvantages magnetic recording-Principle of optical recording-Method of optical recording of sound on film-Working principle of DVD player-Working of DVD player with block diagram-MP3 & MP4 formats-Concept of noise reduction using DOLBY system-Home theatre sound system-Speaker arrangement and features of Dolby Digital 5.1 Surround Sound (AC3).

2. TV Picture & Composite video signal:

Formation of picture-Need for horizontal and vertical scanning-Frame and field frequencies-Need for vertical synchronisation, horizontal synchronisation and blanking pulses-Frequency allocation of T.V. Channels used in India-Standards of T.V. transmissions as per C.C.I.R-Types of scanning-Distinguish between progressive and interlaced scanning-Standard scanning pattern in an interlaced scanning-Need for interlaced scanning with reference to Bandwidth-Different pulses in a composite video signal-Comparision of positive and negative modulation-Composite video signal as per I.S.I. specification-Need for front porch and back porch in blanking pulses-Necessity of equalising pulses and serrated vertical blanking pulses.

3. Colour Television.

Main characteristic of human eye with regard to perception of colours-Additive and subtractive mixing of colours-Complementary colours, hue, saturation, and Colour circle-Compatibility in TV system-Standards of Colour transmission system like NTSC, PAL and SECAM-Chrominance signals are transmitted on one carrier in PAL system-Block diagram of a Colour TV transmitter and state the function of each block-Block diagram of a Colour TV receiver and state the function of each block-Processing of Colour video signal (PAL system) in a Colour receiver-Types of Colour TV monitors-Basic principles of above technologies.

4. **Principles of Cable, Satellite and Smart TV**:

Block diagram of CATV-Cable TV components such as amplifiers directional couplers and Converters-Necessity of mid-band and super-band channels-Need for satellite for TV broadcasting over wide area-Merits of DTH system- DVB-S channel reception with block diagram-Need for SET TOP BOX-Features of Projection TV-Applications of Projection TV-Features of HDTV-Features of SMART TV-Important specifications of UHD TV.

5 Domestic Appliances:

Working principle of Microwave oven-Functional block diagram of Microwave oven-Advantages of Microwave oven-Principle of Induction heater-Reasons for using magnetic metals for use with induction heater-Merits of induction heating-Functional block diagram of Electronic Washing machine-Advantages of Fuzzy logic in washing machines-Functional block diagram of Camcorder-Applications of Camcorder.

REFERENCE BOOKS:

1. Electronic communication systems by Roy Blake, Thomson Delmar.
2. Colour Television by R.R.Gulati. TMH
3. How electronic things work.& what to do when they don't -Robert L. Goodman, -TMH
4. Consumer electronics by SP Bali, -Pearson publications.
5. Digital Satellite Television Handbook By Mark E. Long –Newnes publications

DATA COMMUNICATIONS COMPUTER NETWORKS

Subject Title : Data Communications Computer Networks

Subject Code : EC-504

Periods/Week 05

Periods/Semester : 75

Rationale: The Knowledge of Data communications and communication and computer networks is essential for Electronics & Communication engineering students as everything from Banking to Railway ticket booking being completely computerized there are ample opportunities for the students to get good jobs .

TIME SCHEDULE

Sl	Major Topics	No. of periods	Marks	Short Answer Questions	Essay Questions
1	Basics of Data communication and OSI Layer	15	21	2	1 ½
2	Concepts of LAN & DLL Protocols	15	26	2	2
3	IP addressing & Network Layer Protocols	15	21	2	1 ½
4	WAN Protocols	15	21	2	1 ½
5	Web Applications & Network Security	15	21	2	1 ½
	Total	75	110	10	8

OBJECTIVES

Upon completion of this course the student should be able to:

1.0 Understand the Basics of Data communication & OSI Layer

1.1 Define data communication

1.2 State the need for data communication networking.

1.3 Distinguish between analog and digital data.

1.4 Define computer network and state its use.

1.5 Draw the ISO: OSI 7 layer architecture and explain the function of each layer.

1.6 List the different types of physical transmission media.

1.7 Explain the use of UTP, STP, Coaxial and Fiber optic cable in networking.

1.8 Define simplex, half-duplex and full-duplex communication.

1.9 Define bandwidth and throughput of a physical medium.

1.10 List the three types of switching techniques used in networking.

1.11 Explain circuit switching, packet switching and message switching.

1.12 Explain virtual circuit

1.13 Explain datagram approach in packet switching

2.0 Understand the concepts of LAN and DLL protocols

2.1 Define Local area network and state its use.

2.2 Explain different network topologies (Bus, Star, Ring)

2.3 Compare the performances of the three topologies.

2.4 Explain the working of token ring network.

2.5 Explain the use of different networking devices such as repeater/hub, switch, bridge in constructing networks

2.6 Differentiate between repeater, switch and bridges.

2.7 State the need for protocols in computer networks.

2.8 State the need for framing in data link layer.

2.9 Explain the Ethernet frame format (IEEE 802.3).

2.10 State the need for flow control and error control protocols.

2.11 Explain the point-to-point protocol (PPP).

2.12 Explain CSMA/CD and CSMA/CA.

2.13 Explain the topology of wireless LAN frame format(IEEE802.11)

2.14 Explain the Bluetooth technology.

2.15 Mention the applications of WAP.

3.0 Understand IP addressing and Network layer protocols

3.1 Define the terms Internet and Intranet.

3.2 Define internet protocol.

3.3 Distinguish between connection oriented (virtual circuit) and connectionless (datagram) services.

3.4 Classify the two types of Internet Protocol addressing IPv4 and IPv6 and state the need for IPv6.

3.5 Explain classful addressing and classless addressing in IPv4.

3.6 Explain Internet protocol version-6 (IPv6) addressing.

3.7 Explain the use of routers in networking

3.8 Explain the concept of routers and routing.

3.9 Define cut through & store-and-forward and adaptive switch mechanisms.

3.10 Explain the packet transfer mechanism using routers and IP address.

3.11 Explain the internal architecture of ISP.

4.0 Understand WAN protocols

4.1 Explain WAN architecture.

4.2 List the three commonly used WAN technologies.

4.3 Explain the working of X.25 WAN Protocol

4.4 Explain the FRAME relay WAN Protocol.

4.5 Explain ATM WAN Protocol.

4.6 Explain the ARPANET and WWW.

4.7 Explain different layers of TCP/IP.

4.8 Explain the features of TCP.

4.9 Explain Address Resolution Protocol (ARP).

4.10 Mention the functions of port and sockets.

4.11 Explain the features of UDP

4.12 Explain the connectivity of systems using TCP & UDP

4.13 Explain the use of Gateways.

5.0 Understand Web Applications & Network security.

5.1 Mention the role of DNS server.

5.2 Explain DNS namespace.

5.3 Explain how email is transferred.

5.4 Explain POP server and SMTP server.

5.5 Explain file transfer operation using FTP

5.6 Explain the working of Web server.

5.7 Explain the working of Web browser.

5.8 List HTTP commands.

5.9 Explain the purpose of proxy server.

5.10 Explain the use of hyperlinks.

5.11 Explain the web browser architecture.

5.12 Explain remote login.

5.13 State the need for network security.

5.14 List various security services.

5.15 Define message confidentiality and message integrity

5.16 Define message authentication and entity authentication.

5.17 Explain key management, digital signature and firewalls in securing the networks

5.18 Mention Internet of Things (IOT) and its applications

COURSE CONTENT

1.0 Basics of Data communication & OSI Layer

Data communication-Need for data communication networking-Analog and digital data-Computer network and state its use- ISO: OSI 7 layer architecture and explain the function of each layer-Types of physical transmission media-Use of UTP, STP, Coaxial and Fiber optic cable in networking-Simplex, half-duplex and full-duplex communication-Bandwidth and throughput of a physical medium-Types of switching techniques used in networking-Circuit switching, packet switching and message switching-Virtual circuit and datagram approaches in packet switching.

2.0 Concepts of LAN and DLL protocols:

Local area network and state its use-Network topologies (Bus, Star, Ring)-Compare the performances of the three topologies-Working of token ring network-Use of different networking devices such as repeater/hub, switch, bridge in constructing networks-Repeater, switch and bridges-Need for protocols in computer networks-Need for framing in data link layer- Ethernet frame format (IEEE 802.3)-Need for flow control and error control protocols-Point-to-point protocol (PPP)- CSMA/CD and CSMA/CA-Topology of wireless LAN and its frame format (IEEE 802.11)- Bluetooth technology-Applications of WAP.

3.0 IP addressing and Network layer protocols:

Internet and Intranet-Define internet protocol-Connection oriented (virtual circuit) and connectionless (datagram) services-Types of Internet Protocol addressing IPv4 and IPv6 and state the need for IPv6-Classful addressing and classless addressing in IPv4- Internet protocol version-6 (IPv6) addressing-Use of routers in networking-Concept of routers and routing-Cut through & store-and-forward and adaptive switch mechanisms-Packet transfer mechanism using routers and IP address-Internal architecture of ISP- Dial up access, leased line, DSL, ISDN types of internet connectivity for an individual user/ organization.

4.0 WAN protocols:

WAN architecture-Three commonly used WAN technologies-Working of X.25 WAN Protocol-FRAME relay WAN Protocol- ATM WAN Protocol- ARPANET and WWW-Different layers of TCP/IP-Features of TCP- Address Resolution Protocol (ARP)-Functions of port and sockets-Features of UDP-Connectivity of systems using TCP & UDP-Use of Gateways.

5.0 Understand Web Applications & Network security:

Role of DNS server- DNS namespace-Email transfer- POP server and SMTP server-File transfer operation using FTP-Working of Web server-Working of Web browser- HTTP commands-Purpose of proxy server-Use of hyperlinks-Web browser architecture-Remote login-Need for network security-Various security services-Message confidentiality and message integrity-Message authentication and entity authentication-Key management, digital signature and firewalls in securing the networks. -Internet of Things (IOT) and its applications

REFERENCE BOOKS:

1. Data and Computer Communications: William Stallings 7th edition. PHI .
2. Data Communication and Networking: Behrouz Forouzan 3rd edition.TMH.
3. Computer Networks by Tanenbaum. Andrew S.- Prentice Hall (India) Network .
4. Data Communication and Networking by Godbole TMH .

MICRO CONTROLLER APPLICATIONS

Subject Title : Micro Controller Applications

Subject Code : EC- 505

Periods/Week : 05

Periods/Semester : 75

Rationale: Microcontroller applications is introduced to further develop the concepts learnt in IV semester by giving theoretical inputs at application level. This course will make the students feel confident in the present Electronic industry.

TIME SCHEDULE

Sl	Major Topics	No. of Periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Peripheral Interfacing	15	16	2	1
2	Interfacing External Memory	15	26	2	2
3	Interfacing 8255 PPI	15	26	2	2
4	Interfacing with RTC	15	26	2	2
5	Control Applications	15	16	2	1
	Total	**75**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student should be able to

Understand hardware interfacing

1.1 List various types of Interfacing devices

1.2 Mention the functions of each of the above Interfacing devices

1.3 List the types of ADC chips (Parallel/Serial Interfacing)

1.4 Explain the choice of selecting ADC chip

1.5 Mention the Number and Specification of ADC chips

1.6 Compare the resolution vs Step size of various ADCs

1.7 Give Pin Out diagram of ADC0804 chip

1.8 Explain the functions of Various pins of ADC0804

1.9 Give Formula for determining Clock Frequency of ADC0804

1.10 Distinguish between Analog Ground and Digital Ground

1.11 With the help of a Circuit Diagram explain the Clock Source for ADC 0804

1.12 Write an ALP for Interfacing ADC0804 and Explain

1.13 Mention the use of ADC0808 /ADC0809 for Data Acquisition

1.14 Mention the need for DAC interfacing

1.15 With the help of a circuit Interfacing DAC 808

1.16 Explain the use of DAC0808 for generating a sine wave with an ALP

1.17 Explain Interfacing temperature sensors to 8051

1.18 List Various types of Temperature sensors

1.19 Give Specifications of LM34 and LM35

1.20 With the help of a circuit explain the interfacing of LM35 to 8051

1.21 Explain the need for Signal conditioning for interfacing

2.0 Understand Interfacing External Memory

2.1 Explain semiconductor memories with respect to memory capacity, organization and speed

2.2 List the various types of Memories used and give Typical IC numbers of each type

2.3 Interpret the memory capacity from the IC number

2.4 Explain the Choice of selection of a memory for a particular application

2.5 List any 6 popular UV EPROM chips and explain the pin configuration of any one

2.6 Explain the concept of Checksum with an example

2.7 Compare SRAM , DRAM , NVRAM and Flash Memories

2.8 Explain the organisation of a DRAM

2.9 Explain memory address decoding 740LS138 3 X 8 decoder

2.10 Explain the concept of ONCHIP and External ROM

2.11 Explain interfacing with external ROM

2.12 Explain data memory space of 8051 and accessing

2.13 Explain interfacing of large external memory (256KB)

2.14 Explain the DATA Movement in External RAM using MOVX instruction
With an example (small program to read 100 bytes of data from Port1 and save the data In External RAM location 1000H)

3.0 Understand Interfacing 8255 PPI Chip

3.1. Explain the need for port Expansion

3.2. Explain expansion of I/O ports using 8255

3.3. Mention the features of 8255

3.4. Give the PIN configuration of 8255

3.5. List 3 ports of 8255 and Explain their features

3.6. Define the three modes of operation of 8255

3.7. Explain the concept of MODE selection using control register

3.8. Give 8255 Control word Format(I/O) mode

3.9. With the help of a circuit explain Interfacing 8255 to 8051

3.10. Define the term memory mapped I/O and Explain its application

3.11. Explain the interfacing of LCD with 8051 using 8255

3.12. Explain programming of 8255 in simple I/O mode using 'C' language

4.0 Understand Interfacing RTC

4.1 Define the RTC (Real Time Clock)

4.2 Explain the need for RTC (Real Time Clock)

4.3 List Some Popular RTC ICs-

4.4 Explain the features of DS12887

4.5 Give the Pin configuration of DS12887 IC

4.6 Explain with the help a of a circuit diagram the interfacing of DS12887 to 8051

4.7 Explain Address map of DS12887

4.8 Mention the steps involved in setting the time in DS12887

4.9 Explain the interrupt and alarm features of DS12887

4.10 Mention the application of RTC for a generation of A square wave

5.0 **Understand microcontroller applications**

5.1 Explain the need of relays and opto couplers for interfacing

5.2 Give the numbers of 3 commonly used Opto coupler ICs

5.3 Compare Opto- Coupler and Opto- isolator

5.4 Explain with the help of a circuit diagram the Interfacing 8051 to a relay For driving a 12 V lamp

5.5 Explain with a circuit diagram interfacing a solid state relay to drive a mains operated motor

5.6 Explain with the help of a circuit Diagram Interfacing a stepper motor to 8051

5.7 Write a ALP to run stepper motor continuously

5.8 Explain the controlling of stepper motor using opto isolator

5.9 Explain the use of PWM for controlling the speed of small DC motor.

5.10 Explain the implementation of Lift controller , Water level controller using microcontroller

5.11 Mention other advanced microcontrollers like PIC , ARM

5.12 Explain the RISC architecture

5.13 Explain the RISC Concept

5.14 Compare LIS and RISC Architecture

5.15 Mention the features of PIC controllers

5.16 Compare PIC16F8XX and PIC16CX/7X families

5.17 Explain the block diagrams of ALU operations and PIC16F877

5.18 State the Features of PIC16F877

5.19 Explain the Architecture of PIC micro controller

COURSE CONTENT

1.0 Hardware Interfacing:

Need for hardware Interfacing-Various types of Interfacing devices-Functions of each of the above Interfacing devices-Types of ADC chips (Parallel/Serial Interfacing)-Choice of selecting ADC chip- Number and Specification of ADC chips-Resolution vs Step size of various ADCs- Pin Out diagram of ADC0804 chip-Functions of Various pins of ADC0804-Formula for determining Clock Frequency of ADC0804- Analog Ground and Digital Ground-With the help of a Circuit Diagram explain the Clock Source for ADC 0804- ALP for

Interfacing ADC0804 -Use of ADC0808 /ADC0809 for Data Acquisition-Need for DAC interfacing- Interfacing DAC 808-Use of DAC0808 for generating a sine wave - Interfacing temperature sensors to 8051- Various types of Temperature sensors- Specifications of LM34 and LM35- Interfacing of LM35 to 8051-Need for Signal conditioning for interfacing.

2.0 Interfacing External Memory:

Semiconductor memories with respect to memory capacity, organization and speed-Various types of Memories used and give Typical IC numbers of each type-Memory capacity from the IC number- Choice of selection of a memory for a particular application-Popular UV EPROM chips - pin configuration -Concept of Checksum with an example-Compare SRAM, DRAM, NVRAM and Flash Memories- Organization of a DRAM-Memory address decoding 740LS138 3 X 8 decoder-Concept of ONCHIP and External ROM-Interfacing with external ROM-Data memory space of 8051 and accessing-Interfacing of large external memory (256KB)- DATA Movement in External RAM using MOVX instruction-With an example

3.0 **Interfacing 8255 PPI Chip:**

Need for port Expansion-Expansion of I/O ports using 8255-Features of 8255- PIN configuration of 8255-Ports of 8255 - features-Modes of operation of 8255-Concept of MODE selection using control register- 8255 Control word Format(I/O) mode- Interfacing 8255 to 8051-Term memory mapped I/O and its application-Interfacing of LCD with 8051 using 8255-Programming of 8255 in simple I/O mode using 'C' language.

4.0 **Interfacing RTC:**

RTC (Real Time Clock)-Need for RTC (Real Time Clock)- Some Popular RTC ICs-Features of DS12887- Pin configuration of DS12887 IC-Interfacing of DS12887 to 8051- Address map of DS12887-Steps involved in setting the time in DS12887-Interrupt and alarm features of DS12887-Application of RTC for a generation of A square wave.

5.0 Microcontroller applications:

Need of relays and opto couplers for interfacing-Commonly used Opto coupler ICs-Comparision of Opto- Coupler and Opto- isolator- Interfacing 8051 to a relay for driving a 12 V lamp-Interfacing a solid state relay to drive a mains operated motor- Interfacing a stepper motor to 8051- ALP to run stepper motor continuously-Controlling of stepper motor using opto isolator-Program in C for the above application-Pulse width modulation (PWM)-Use of PWM for controlling the speed of small DC motor-Interfacing circuit for Control of a small

DC motor using opto isolator a)Darlington Transistor b) MOSFET-Program in C for PWM speed Control of a small DC motor-Lift Controller. Water level Controller application with the help of a Block Diagram-Application of a temperature controller with the help of a Block Diagram.

REFERENCE BOOKS:

1. The 8051 Micro controller and Embedded systems , by Muhammad Ali Mazidi, Janice Mazidi, Janice Gillispie Mazidi Pearson-Prenticehall publication
2. Programming customizing the 8051 Microcontroller by Myke Predko TMH
3. Microcontrollers (theory and applications) by Ajay V Deshmukh
4. Microcontroller By Kenneth J. Ayala -Thomson Delmar publications

MOBILE & FIBRE OPTIC COMMUNICATION

Subject Title : **Mobile & Fibre Optic Communication (Elective A)**

Subject Code : EC-506 (A)

Periods/Week : 05

Periods/Semester : 75

Rationale: The Course Mobile communication is included keeping the ever growing man power requirements in Telecommunications Industry. This course covers the fundamentals of mobile communications.

TIME SCHEDULE

Sl	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Introduction to wireless communication system	9	13	1	1
2	Cellular system design fundamentals	15	16	2	1
3	Multiple access techniques	15	26	2	2
4	Digital Cellular mobile system	15	26	2	2
5	Basics of Fibre optic Communication	9	13	1	1
6	Fibre Optic Devices	12	16	2	1
	Total	**75**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student should be able to

1.0 Know wireless communication system

1.1 List the limitations of conventional mobile phone system.

1.2 Mention the evolution of cellular mobile communication system.

1.3 Define the terms mobile station and base station

1.4 State the functions of Mobile switching centre (MSC)

1.5 List various channels in mobile communication

1.6 Define voice and control channels in mobile communication

1.7 Define Roamer

1.8 List the features of various mobile radio systems around the world

1.9 Define simplex, half duplex and full duplex channels.

1.10 Distinguish between frequency division duplex (FDD) and time division duplex (TDD).

1.11 Define uplink and downlink channels in mobile communication

1.12 Draw the block diagram of a basic cellular system.

1.13 Explain the process of call progress in a cellular telephone system

2.0 Understand Cellular system design fundamentals

2.1 State the need for cellular concept in mobile communication

2.2 State the need for hexagonal cell site.

2.3 Explain the concept of Frequency reuse.

2.4 Explain capacity of a mobile cellular system.

2.5 Define the term Cell

2.6 Define the term cluster

2.7 Explain the capacity of a cellular system

2.8 State the relation between capacity and cluster size.

2.9 State the probable sizes of cluster with formula.

2.10 Define co-channel interference.

2.11 State the relation between co-channel interference and system capacity.

2.12 Define Hand-off in mobile communication

2.13 Explain channel assignment strategies

2.14 List two methods of improving channel capacity

2.15 Explain Cell splitting and sectoring

2.16 Define micro-cell concept

2.17 Define umbrella cell

3.0 Understand Multiple access techniques

3.1 State the need for multiple access techniques

3.2 List the three types of multiple access techniques.

3.3 Explain FDMA

3.4 List the features of FDMA

3.5 Explain TDMA

3.6 Draw the TDMA frame structure

3.7 List the features of TDMA

3.8 Explain the concept of spread spectrum technique

3.9 List two types of spread spectrum techniques

3.10 Explain code division multiple access technique.

3.11 List the features and advantages of CDMA

3.12 Compare FDMA, TDMA and CDMA

3.13 State near-far effect in CDMA

4.0 Comprehend Digital Cellular mobile system

4.1 Mention the features of digital cellular system.

4.2 Explain the Global system for mobile communication (GSM)

4.3 Explain the GSM architecture with block diagram.

4.4 List various interfaces in GSM architecture

4.5 Explain the GSM radio subsystem

4.6 Explain the frame structure of the GSM

4.7 List the service and security aspects of GSM.

4.10. Mention the demerits of GSM system.

4.11. List the features of GPRS

4.12. List the features of EDGE

4.13. Compare the features of GSM, GPRS and EDGE systems

4.14. List the salient features of 3G system

4.15. List the advantages of 3G over earlier versions

4.16. List the basic concepts of 4G aspects

4.17. Mention the merits of LTE and VOLTE systems

5.0 Understand the basics of Fibre Optic Communication

5.1. Mention the advantages of Light wave communication system over EM wave systems.

5.2. Mention different optical spectral bands.
5.3. List the three generations of optical fibres
5.4. Explain the structure of optical fibre
5.5. Classify optical fibres based on refractive index profile
5.6. List the types of fibres based on core diameter
5.7. Define Single mode fibre (SMF)
5.8. Define multimode fibre (MMF)
5.9. List the advantages of SMFs over MMfs.
5.10. Define Snell's law in optics
5.11. Explain Total internal reflection in optical fibre.
5.12. Define acceptance angle
5.13. Define cone of acceptance.
5.14. Define numerical aperture (NA)
5.15. Derive the expression for NA in terms of core and cladding refractive indices.
5.16. List the advantages of optical fibres over other communication media

6.0 Know Fibre Optic Devices

6.1. List two types of sources used in OFC
6.2. Mention salient features of an optical source
6.3. List two types of detectors used in OFC
6.4. Mention important features of an optical detector
6.5. Explain the construction and working of an LED
6.6. State the principle of LASER.
6.7. List the differences between LED and LASER sources
6.8. Explain the construction and working of PIN photo diode.
6.9. Draw the block diagram of fibre optic communication system and explain each block.
6.10. Explain the need for repeater/regenerator in FOC
6.11. List three types of repeaters
6.12. Compare R, 2R and 3R repeaters.
6.13. Distinguish between repeaters and optical amplifiers.

COURSE CONTENT

1. **Introduction to wireless communication systems :** Limitations of conventional mobile phone system-Evolution of cellular mobile communication system-Mobile station and base station-Functions of Mobile switching centre (MSC)-Various channels in mobile communication-Voice and control channels in mobile communication-Roamer-Features of various mobile radio systems around the world-Simplex, half duplex and full duplex channels-Frequency division duplex (FDD) and time division duplex (TDD)-Uplink and downlink channels in mobile communication-Block diagram of a basic cellular system-Call progress in a cellular telephone system

2. Cellular system design fundamentals: Need for cellular concept in mobile communication-Hexagonal cell site-Frequency reuse-Capacity of a mobile cellular system-Definition of the term Cell-Cluster- Relation between capacity and cluster size- Probable sizes of cluster with formula-Co-channel interference- Relation between co-channel interference and system capacity- Hand-off in mobile communication- Channel assignment strategies-Methods of improving channel capacity-Cell splitting and sectoring- Micro-cell concept- Umbrella cell

3. Multiple access techniques: Need for multiple access techniques-Types of multiple access techniques-FDMA-Features of FDMA- TDMA-TDMA frame structure-Features of TDMA-Concept of spread spectrum technique-Types of spread spectrum techniques-Direct sequence spread spectrum (DSSS) technique- Frequency hopped spread spectrum (FHSS) multiple access technique-Code division multiple access technique-Features and advantages of CDMA-Comparision of FDMA, TDMA and CDMA- Near-far effect in CDMA

4. Digital Cellular mobile system :

features of digital cellular system- Global system for mobile communication (GSM)- GSM architecture with block diagram- Interfaces in GSM architecture- GSM radio subsystem-Explain the frame structure of the GSM - Service and security aspects of GSM- Demerits of GSM system- Features of GPRS, EDGE- Comaprision of GPRS, GSM, and EDGE systems - Salient features of 3G system- Advantages of 3G over earlier versions- Basic concepts of 4G - Merits of LTE and VOLTE systems

5.Basics of Fibre Optic Communication:

Advantages of Light wave communication system over EM wave systems.- Different optical spectral bands- Different generations of optical fibres- Structure of optical fibre-Classification of optical fibres based on refractive index profile- Types of fibres based on core diameter- Single mode fibre (SMF)- Multimode fibre (MMF)- Advantages of SMFs over MMfs- Snell's law in optics- Total internal reflection in optical fibre- Acceptance angle-Define cone of acceptance-Numerical aperture (NA)- Expression for NA in terms of core and cladding refractive indices-Advantages of optical fibres over other communication media

6.Fibre Optic Devices:

Types of sources used in OFC- Features of an optical source- Types of detectors used in OFC-important features of an optical detector- Construction and working of an LED- Principle of LASER- Construction and working of LASER source- Differences between LED and LASER sources- Construction and working of PIN photo diode- construction and working of APD (Reach through APD)- Need for repeater/regenerator in FOC- Types of repeaters-Compare R, 2R and 3R repeaters- comparison of repeaters and optical amplifiers- block diagram of Erbium Doped Fibre Amplifier (EDFA)- principle and operation of EDFA- Block diagram of fibre optic communication system - Other applications of LED and LASER

REFERENCE BOOKS:

1. Mobile and Personal communication sytems and services by Raj Pandya, PHI
2. Wireless communications-Principles and practice by Theodore S. Rappaport, PEARSON
3. Mobile Communications by Jochen Schiller, PEARSON
1. Optical Fiber Communications by Gerd Keiser McGraw Hill
2. Optical fiber and Laser- Principles and applications by Anuradha De, New Age publications

BASIC VLSI CIRCUITS

Subject Title : **Basic VLSI Circuits (Elective B)**

Subject Code : EC-506 (B)

Periods/Week : 05

Periods/Semester : 75

Rationale: The Course Basics of VLSI Circuits is included keeping the high demand for Diploma Engineers with skills in VLSI design . This course covers the Basics of VLSI circuits

TIME SCHEDULE

S. No	Major Topics	No of Periods	Weightage of marks	Short type	Essay type
1	Introduction to MOS technology	15	15	2	1
2	Basic Electrical Properties of MOS and BiCMOS Circuits	15	25	2	2
3	MOS and BiCMOS Circuit Design Processes	15	25	2	2
4	Basic circuit concepts	15	25	2	2
5	Introduction to Verilog HDL	15	10	2	1
	Total	75	110	10	8

OBJECTIVES

1.0 Introduction to MOS technology

1.1 Evolution of Integrated circuit technology

1.2 Describe Metal Oxide Semiconductor (MOS) and VLSI Technology

1.3 Draw Basic MOS transistor

1.4 Explain Enhancement mode transistor .

1.5 Explain Depletion mode transistor.

1.6 Explain nMOS fabrication process.

1.7 Explain pMOS fabrication process.

1.8 List steps in CMOS fabrication – the p-well process.

1.9 List steps in CMOS fabrication – the n-well process.

1.10 List steps in CMOS fabrication – Twin tube process.

1.11 Explain BiCMOS technology.

1.12 Compare CMOS and Bipolar technologies.

2.0 Analyze Basic Electrical Properties of MOS and BiCMOS Circuits

2.1 Derive drain to source current I_{ds} versus voltage V_{ds} relationships.

2.2 Examine aspects of MOS transistor threshold voltage V_t

2.3 Explain MOS transistor transconductance gm and output conductance g_{ds}.

2.4 Define MOS transistor figure of merit ω_0.

2,5 Explain the pass transisitor.

2.5 Explain the nMOS inverter,

2.6 Determine pull-up to pull-down ratio ($Z_{p.u}./Z_{p.d.}$) for an nMOS inverter driven by another nMOS inverter.

2.7 Explain Pull-up to pull-down ratio for an nMOS inverter driven through one or more pass transistors.

2.8 Differentiate alternative forms of Pull-up.

2.9 Explain the CMOS inverter – five regions of operation.

2.10 Draw MOS transistor circuit model.

2.11 Compare aspects of key parameters of CMOS and Bipolar transistors.

2.12 Draw BiCMOS inverters.

2.13 Examine latch-up in CMOS circuits.

2.14 Explain BiCMOS latch-up susceptibility.

3.0 Design Processes of MOS and BiCMOS Circuits

3.1 Illustrate MOS layers.

3.2 Sketch Stick diagrams.

3.3 Describe nMOS design style.

3.4 Describe CMOS design style.

3.5 Apply Design rules.

3.6 Apply Lambda-based design rules.

3.7 Illustrate Contact cuts.

3.8 List Double metal MOS process rules.

3.9 List CMOS lambda-based design rules.

3.10 Describe Layout diagrams.

3.11 Draw the simple CMOS layout.

4.0 Understand Basic circuit concepts

4.1 Define Sheet resistance

4.2 Calculate Inverter resistance.

4.3 Explain Area capacitances of layers.

4.4 Define Standard unit of capacitance □Cg

4.5 Calculate area capacitance.

4.6 Define the delay unit (ĩ)

4.7 Explain Inverter delays.

4.8 Explain Rise-time and fall-time estimations of CMOS inverter.

4.9 Explain Cascaded inverters as drivers.

4.10 Explain Inverting type nMOS super buffer.

4.11 Explain BiCMOS drivers.

4.12 Explain Propagation delays – cascaded pass transistors.

4.13 Describe long polysilicon wires.

4.14 Explain Wiring capacitances.

5.0 Understand Design flow for designing VLSI IC and concepts of Verilog HDL

5.1. Explain the use of Verilog VHDL in VLSI simulation

5.2. Explain the steps involved in the design flow for the VLSI IC design

5.3. Explain the importance of Hardware Description Languages in VLSI design

5.4. Compare VHDL and Verilog HDL

5.5. List the features of Verilog HDL

5.6. Explain the difference between an instantiation and inference of a component.

5.7. Explain differences between modules and module instances in Verilog.

5.8. Explain four levels of abstraction to represent the internals of a module

5.9. Identify the components of a Verilog module definition

5.10. Explain the port connection rules in a module instantiation

5.11. Explain the lexical conventions like number specification, Identifiers keywords, etc

5.12. Mention different data types like value set, nets, registers, vectors, integer, real and time register data types, arrays, memories and strings.

5.13. Explain defparam and localparam keywords

5.14. Explain about system tasks and compiler directives

5.15. Define expressions, operators and operands.

5.16. Mention important types of operators used in the Verilog HDL

COURSE CONTENT:

1. **Introduction to MOS technology:** Evolution of Integrated circuit technology, Metal Oxide Semiconductor (MOS) and VLSI Technology, Basic MOS transistor, Enhancement mode transistor, Depletion mode transistor. nMOS fabrication process, pMOS fabrication process, CMOS fabrication – the p-well process,CMOS fabrication – the n-well process, CMOS fabrication – Twin tube process, BiCMOS technology, CMOS and Bipolar technologies.

2. **Basic Electrical Properties of MOS and BiCMOS Circuits :** Drain to source current I_{ds} versus voltage V_{ds} relationships, aspects of MOS transistor threshold voltage MOS transistor trans conductance g_m and output conductance g_{ds},MOS transistor figure of merit ω_0, pass transistor, nMOS inverter pull-up to pull-down ratio ($Z_{p.u}./Z_{p.d.}$) for an nMOS inverter driven by another nMOS invert, Pull-up to pull-down ratio for an nMOS inverter driven through one or more pass transistors, alternative forms of Pull-up, CMOS inverter – five regions of operation, MOS transistor circuit model, key parameters of CMOS and Bipolar transistors, BiCMOS inverters, latch-up in CMOS circuits, BiCMOS latch-up susceptibility.

3. **Design Processes of MOS and BiCMOS Circuits :**MOS layers, Stick diagrams, nMOS design style, CMOS design style, Design rules, Lambda-based design rules, Contact cuts, Double metal MOS process rules, CMOS lambda-based design rules, Layout diagrams, CMOS layout.

4. Basic circuit concepts: Sheet resistance, Inverter resistance. ,Area capacitances of layers, Standard unit of capacitance □Cg, area capacitance calculation, delay unit (ĩ), Inverter delays, Rise-time and fall-time estimations of CMOS inverter, Cascaded inverters as drivers, Inverting type nMOS super buffer ,BiCMOS drivers. Propagation delays – cascaded pass transistors, Long polysilicon wires, wiring capacitances.

5. Understand Design flow for designing VLSI IC and concepts of Verilog HDL

Use of Verilog VHDL in VLSI simulation- Steps involved in the design flow for the VLSI IC design- Importance of Hardware Description Languages in VLSI design-Compare VHDL and Verilog HDL-Features of Verilog HDL- Instantiation and inference of a component- Modules and module instances in Verilog - Four levels of abstraction to represent the internals of a module- Components of a Verilog module definition- port connection rules in a module instantiation- Lexical conventions like number specification, Identifiers keywords, etc- Different data types like value set, nets, registers, vectors, integer, real and time register data types, arrays, memories and strings- defparam and localparam keywords- System tasks and compiler directives-Define expressions, operators and operands- Types of operators used in the Verilog HDL

REFERANCE BOOKS

1. PUCKNELL & ESHRAGHIAN: Basic VLSI design, PHI, (3/e), 1996
2. E.WESTE & ESHRAGHIAN: Principles of CMOS VLSI design, addition Wesley, 1994
3. M.CONWAY: Introduction to VLSI systems, addition Wesley, 1980
4. A.MUKHERJIE: Introduction to NMOS and CMOS system design, PHI,1986

INDUSTRIAL ELECTRONICS LAB PRACTICE

Subject Title : **Industrial Electronics Lab Practice**

Subject Code : **EC-507**

Periods/Week : **03**

Periods/Semester : **45**

Rationale: Industrial Electronics lab is included in the VI semester to make the students industry ready by giving them practical inputs and making them experiment with Power Electronic devices which are in wide usage in Industry. This helps the students to get better job opportunities and work with confidence.

TIME SCHEDULE

Sl	**Major Topics**	**Periods**
1	Power devices	9
2	UJT Circuits	9
3	Power control Techniques	12
4	Sensors and Transducers	15
	TOTAL	**45**

List of Laboratory Exercises

I. Power devices

1. Identify and test using DMM the Power Semiconductor devices SCR, TRIAC, DIAC,, SUS SBS
2. Identify and test using DMM MOSFET, IGBT, LASCR, UJT, OPTO COUPLERS MCT2E, MOC 3011 .
3. Plot the characteristics of MOSFET and determine gate source threshold voltage
    a) Implement a MOSFET switch and control a 6V lamp using NAND gate
4. Plot the characteristics of SCR and determine Triggering current
    a) To Verify 3 methods of switching off scr.
    b) To design a simple burglar alarm circuit using SCR and test it

II. UJT Circuits

5. Plot the characteristics and determine the intrinsic standoff ratio of UJT
6. Construct UJT Relaxation oscillator circuit and observe the output waveforms on CRO

III. Power control

7. Trigger the SCR by UJT and control output Power
8. Plot the characteristics of TRIAC and DIAC
    a) Verify that TRIAC can be triggered by positive and negative pulses
    b) Verify 3 methods of switching off TRIAC
9. Implement 100 watt 230V AC Lamp Control circuit using Optocoupler MOC3011 and 4 Amps TRIAC.
10. Vary the speed of a 1 phase 230V AC motor using TRIAC-DIAC phase control

a) Observe the waveforms at the gate terminal and load using isolation transformer on CRO
b) Replace the motor with a 230 volts incandescent lamp and observe the waveforms on CRO

IV, Transducers

11. Draw the performance characteristics of LVDT

12, Draw the performance characteristics of RTD

13. Measure the temperature using IC LM 335

14. Implement an ON/OFF temperature controller using IC LM335

15. Draw the characteristics of Load cell

Competencies and Key competencies to be achieved

Exp no	Name of the experiment (NO of Periods)	Competencies	Key competencies
1	To Identify Power Semiconductor devices SCR, TRIAC, DIAC,, SUS SBS, MOSFET, IGBT, LASCR, UJT, HEATSINKS, OPTO COUPLERS MCT2E, MOC 3011 .(3)	➢ Identify of SCR, TRIAC , DIAC ➢ Identify various SCR family devices and their symbols ➢ Identify their symbols &Terminals ➢ Read the data sheets and identifythe terminals ➢ Note down the typical	▪ Identify of SCR, TRIAC , DIAC ▪ Identify various SCR family devices and their symbols ▪ Identify their symbols &Terminals ▪ Read the data sheets and identifythe terminals

		applications from the data sheet	▪ Note down the typical applications from the data sheet ▪
2	To plot the characteristics of MOSFET and determine gate source threshold voltage a)To implement a MOSFET switch and control a 6V lamp using NAND Gate .(3)	➢ Identify MOSFET and its package ➢ Interpret specifications from datasheets ➢ Test the MOSFET using digital multimeter. ➢ Rig up the circuit ➢ Interface with TTL Gates	▪ Identify MOSFET and its package ▪ Interpret specifications from datasheets ▪ Test the MOSFET using digital multimeter. ▪ Rig up the circuit ▪ Interface with TTL Gates
3	To plot the characteristics of SCR and determine Triggering current a) To Verify 3 methods of switching off SCR. b) To design a simple burglar alarm circuit using SCR and test it .(3)	➢ Identify the SCR by its package & Number ➢ Rig up the circuit ➢ Carefully apply Micro Amperes of current to Gate ➢ Note the trigger current ➢ Commutate SCR ➢ Use SCR in circuits	▪ Rig up the circuit ▪ Carefully apply Micro Amperes of current to Gate ▪ Note the trigger current ▪ Commutate SCR ▪ Use SCR in circuits
4	To plot the characteristics and determine the intrinsic standoff ratio of UJT .(3)	➢ Identify UJT by its package & Number ➢ Test the UJT using digital multimeter. ➢ Rig up the circuit	▪ Rig up the circuit ▪ Test the UJT using digital multimeter. ▪ Determine intrinsic standoff Ratio

		➢ Determine intrinsic standoff Ratio	
5	To construct UJT Relaxation oscillator circuit and observe the output waveforms on CRO.(3)	➢ Identify UJT by its package & Number ➢ Test the UJT using digital multimeter. ➢ Rig up the circuit ➢ Observe the output at Emitter .B1 and B2 on CRO ➢ Use UJT for saw tooth wave generation	▪ Test the UJT using digital multimeter. ▪ Rig up the circuit ▪ Observe the output at Emitter .B1 and B2 on CRO ▪ Use UJT for saw tooth wave generation
6	To Trigger the SCR by UJT and control FW Rectified 30V DC output Power .(3)	➢ Rig up the circuit ➢ Test he circuit ➢ Observe the UJT Trigger waveform on CRO ➢ Observe & Measure the load Voltage on CRO ➢ Observe the effect of changing RC Values	▪ Test he circuit ▪ Observe the UJT Trigger waveform on CRO ▪ Observe & Measure the load Voltage on CRO ▪ Observe the effect of changing RC Values
7	To plot the characteristics of TRIAC and DIAC a) To verify that TRIAC can be triggered by positive and negative pulses b) To Verify 3 methods of switching off TRIAC.(3)	➢ Identify TRIAC by its number & its package ➢ Identify the terminals by observation & with DMM ➢ Apply trigger pulse ➢ Estimate TRIAC rating by its size	▪ Identify TRIAC by its number & its package ▪ Identify the terminals by observation & with DMM ▪ Apply trigger pulse ▪ Estimate TRIAC rating by its size

8	To implement 100 watt 230V AC Lamp Control circuit using Optocoupler MOC3011 and 4Amps TRIAC. .(3)	➢ Identify CA3011 opto-coupler terminals ➢ Test the optocoupler with DMM ➢ Rig up the circuit ➢ Test the circuit by applying low (1.5V) at input	▪ Identify CA3011 opto-coupler terminals ▪ Test the optocoupler with DMM ▪ Rig up the circuit ▪ Test the circuit by applying low (1.5V) at input
9	To vary the speed of a 1 phase 230V AC motor using TRIAC-DIAC phase control.(3) a) Observe the waveforms at the gate terminal and load using isolation transformer on CRO b) Replace the motor with a 230 volts incandescent lamp and observe the waveforms on CRO c) Measure the output power with watt meter.	➢ Select the TRIAC & DIAC ➢ Identify the terminals ➢ Test them with DMM ➢ Rig up the circuit ➢ Observe the distorted output wave form on CRO ➢ Measure the output power with wattmeter	▪ Identify the terminals ▪ Test them with DMM ▪ Rig up the circuit ▪ Observe the distorted output wave form on CRO ▪ Measure the output power with wattmeter
10	To assemble a PWM inverter circuit with centre tapped Transformer, Power MOSFETS and Test . .(3)	➢ Identify the parts ➢ Assemble the parts ➢ Make Electrical connections ➢ Connect to the battery ➢ Observe polarity	▪ Identify the parts ▪ Assemble the parts ▪ Make Electrical connections ▪ Connect to the battery ▪ Observe polarity

		➢ Test the inverter on Load	▪ Test the inverter on Load
11	To Vary the speed of a Small DC motor using pulse width modulation .(3)	➢Identify the board ➢Note down the PWM IC number (LM 3524) pin configuration ➢Note down the number of Power Transistor ➢Measure the speed ➢Observe the effect of PWM on CRO	▪ Note down the PWM IC number (LM 3524) pin configuration ▪ Note down the number of Power Transistor ▪ Measure the speed ▪ Observe the effect of PWM on CRO
12	To draw the regulation characteristics of servo stabilizer.(3)	➢Assemble the circuit ➢Connect variable lamp load ➢Apply variable input voltage using Auto Transformer ➢Measure output voltage ➢Note upper & Lower voltage cut off points	▪ Apply variable input voltage using Auto Transformer ▪ Measure output voltage ▪ Note upper & Lower voltage cut off points
13	To assemble a servo Stabilizer and Test.(3)	➢Identify the parts ➢Assemble the parts ➢Make Electrical connections ➢Test the Servo stabilizer on load ➢Apply variable Input voltage ➢Determine Upper &Lower cut off Voltages ➢Observe rate of Voltage	▪ Assemble the parts ▪ Make Electrical connections ▪ Test the Servo stabilizer on load ▪ Apply variable Input voltage ▪ Determine Upper &Lower cut off Voltages ▪ Observe rate of Voltage correction

		correction	
14	To draw the performance characteristics of RTD.(3)	➢ Identify RTD transducer ➢ Prepare experimental set up ➢ Increase the temperature in steps ➢ Measure the output voltage	▪ Identify RTD transducer ▪ Prepare experimental set up ▪ Increase the temperature in steps ▪ Measure the output voltage
15	To measure the temperature using IC LM 335.(3)	➢ Identify LM335 IC ➢ Identify its terminals ➢ Rig up the basic circuit ➢ Increase the temperature in steps ➢ Note down the corresponding output voltage	▪ Identify LM335 IC ▪ Identify its terminals ▪ Rig up the basic circuit ▪ Increase the temperature in steps ▪ Note down the corresponding output voltage

COMPUTER HARDWARE & NETWORKING LAB PRACTICE

Subject Title : Computer Hardware & Networking Lab Practice .

Subject Code : EC-508

Periods/Week : 3

Periods/Semester : 45

Rationale: With the computer becoming a household item , the need for Computer hardware knowledge need not be stressed. Computer hardware industry is another major area where excellent job opportunities are available. Experiments in Optical fibre communication are also included to give additional practical inputs.

TIME SCHEDULE

S. No.	PRACTICE	**No. of Periods**
1.	Cleaning	6
2	Basic computer Hardware	12
3.	Computer Peripherals	6
4	Networking	15
5	Fibre Optics	6
	Total	45

List of Laboratory Exercises

1.0 PC Hardware- Identification of System Layout.

A. Cleaning the computer with Micro Fibre cloth , Brushes and blower

B. Basic Computer hardware

a) Identify Basic Computer Hardware and Cables
b) Identify and note down mother board , Components and Chips

c) Identify various Internal and External slots in the mother board and clean them with blower/ Brush.
d) Practice Inserting and Removing RAM with care
e) Measure the Output voltages of SMPS
f) Disassemble the PC
g) Assemble the PC and test
h) Change CMOS Setup
i) Install Operating system Windows and Linux
j) Verify the function of control panel settings.
k) Partition and format Hard disks.
l) Install system and application software
    a. To install & Run antivirus software
m) Carry out Preventive maintenance of a PC
n) Take Backup of C drive
o) Identify Laptop Hardware
p) Carry out PC Troubleshooting

2.0 Printers , Scanners, Cameras

1. Connect , operate and maintain i) Inkjet Printer ii) Laser Printer iii)Scanner iv) Web Cam
2. Practice Soldering and desoldering of SMD components

3. Computer Networking

a) identify and note down the specifications of various networking devices & Cables, Jacks , Connectors, tools etc used in local area networks
    a. Prepare the UTP cable for cross and direct connections using crimping tool.
b) Transfer files between systems in LAN using FTP Configuration,
    a. install i Print server in a LAN and share the printer in a network
c) Test the Network using ipconfig, ping / tracert and Netstat utilities and debug the network issues (3)
d) Install and configure Network Devices: HUB ii) Switch iii) Routers

e) Configure Host IP, Subnet Mask and Default Gateway in a system in LAN (TCP/IP Configuration).

   a. Configure DNS to establish interconnection between systems

f) Transfer files between systems in LAN using FTP Configuration,

   a. install Print server in a LAN and share the printer in a network

g) Install and Configure Wireless NIC and transfer files between systems in LAN and Wireless LAN

h) access a remote desktop using Team viewer software

   a. store the files in Cloud using Google drive/One drive/Drop box & share

i) Explore the features of Windows 2000 server

4.0 Fiber Optics

3. Set up fiber optic analogue link.

   a) Set up a fiber optic digital link

4. Verify modulation & Demodulation of light source by pulse width modulation technique.
5. Test Fiber optic Voice Link.
6. Verify the NRZ & RZ modulation formats in Optical Communication.

MICROCONTROLLER APPLICATIONS LAB PRACTICE

SUBJECT TITLE : MICROCONTROLLER APPLICATIONS LAB PRACTICE
SUBJECT CODE : EC-509
PERIODS/WEEK : 03
PERIODS/SEMESTER : 45

Rationale: Microcontroller Applications Lab Practice is included in the same semester to ensure contiguity and give an opportunity for the students to reinforce their theoretical knowledge by practically verifying in the laboratory. care has been taken to match the Experiments with field requirements.

TIME SCHEDULE

S. No.	EXPERIMENTS	**No. of Periods**
1.	Practice with Microcontroller Kit	06
2.	Interfacing Switches & LEDs	09
3.	Interfacing Relays & 7 segment displays	15
4	Interfacing DAC /ADC/Loading the program	15
	Total	45

List of Laboratory Exercises

I.practice Interfacing Techniques

1. Micro controller interfacing

Write programs in C for the following exercises

1. Get familiarized with Keil IDE

A) perform the following i. Creating a new project and save ii. Write sample code in assembly and C language iv Run the program V. Debug the program

II. Interfacing Switches and LEDS to 8051

2. Write a program in C to keep monitoring P1.2 bit until it becomes high and send a high to low pulse to P2.3

3. Write a C program to monitor to get the status of switch connected to P1.0 and indicate the same on LED connected to pin P2.7

4. Write a C program Make an LED connected to port 1.5, light up for specific time on pressing a switch connected to port 2.3

5. Write a Program to make an LED connected to pin 1.7 to blink at a specific rate

6. Interface a Relay to 8051 port 1.X to Control a AC 230 V Lamp using optocoupler

7.. Interface 3-digit 7SEGMENT LED DISPLAY using timer for digit scan

8. Interface a Single DOTMATRIX DISPLAY and display the given number

9. Interface a (3x4 matrix) Key Board to 8051

10. Control the direction of rotation of a small DC motor

11. Interface I^2C BUS Device using DS1307 IC .

12 Interface a) ADC IC b) DAC IC and test

13. Interface Microcontroller serial interface to PC COM port and transmit data

15. Burn executable code into EPROM

a) Burn executable code into flash memory for 89C51

Competencies and Key Competencies

Exp No	Name of the Experiment (No of Periods)	Competencies	Key Competencies
1	Get familiarized with Keil IDE A) perform the following i. Creating a new project and save ii. Write sample code in assembly and C language iv Run the program V. Debug the program	➢ Open new /Old project ➢ Enter/modify the program ➢ Debug and Run the program ➢ Test the program	▪ Open new /Old project ▪ Enter/modify the program ▪ Debug and Run the program ▪ Test the program
2	i) Write a program in C Make an LED connected to port 1.5, light up for specific time on pressing a switch connected to port 2.3 ii) Write a Program to make an LED connected to pin 1.7 to blink at a specific rate	➢ Initialize the port ➢ Use correct programming technique ➢ Connect switches ➢ Run , Debug and Test the program	▪ Initialize the port ▪ Use correct programming technique ▪ Connect switches ▪ Run , Debug and Test the program ▪
3	Write a program in C to Write a	➢ Initialize the port	▪ Initialize the port

	program in C to keep monitoring P1.2 bit until it becomes high and send a high to low pulse to P2.3	➢ Use correct programming technique ➢ Connect switches ➢ Run , Debug and Test the program ➢	▪ Use correct programming technique ▪ Connect switches ▪ Run , Debug and Test the program
4	Write a C program to monitor to get the status of switch connected to P1.0 and indicate the same on LED connected to pin P2.7	➢ Initialize the port ➢ Use correct programming technique ➢ Connect switches &LEDS ➢ Run , Debug and Test the program	▪ Initialize the port ▪ Use correct programming technique ▪ Connect switches &LEDs ▪ Run , Debug and Test the program
5	Write a C program Make an LED connected to port 1.5, light up for specific time on pressing a switch connected to port 2.3	➢ Initialize the port ➢ Use correct programming technique ➢ Connect switches &LEDS ➢ Run , Debug and Test the program	▪ Initialize the port ▪ Use correct programming technique ▪ Connect switches &LEDs ▪ Run , Debug and Test the program
6	Write a Program to make an LED connected to pin 1.7 to blink at a specific rate	➢ Initialize the port ➢ Use correct programming technique ➢ Connect switches &LEDS ➢ Run , Debug and Test the program	▪ Initialize the port ▪ Use correct programming technique ▪ Connect switches &LEDs ▪ Run , Debug and Test the program
7	Write a C program to convert packed BCD 0x29 to ASCII	➢ Use correct programming	▪ Use correct programming

	and display the bytes on P1 and P2	technique	technique ▪ Run , Debug and Test the program
8	Interface a Relay to 8051 port 1.X to Control a AC 230 V Lamp	➢ Initialize the port ➢ Use correct programming technique ➢ Connect switches &Relays ➢ Run , Debug and Test the program	▪ Initialize the port ▪ Use correct programming technique ▪ Connect switches &Relays ▪ Run , Debug and Test the program
9	Interface 3-digit 7SEGMENT LED DISPLAY using timer for digit scan	➢ Initialize the port ➢ Use Timer for digit scan ➢ Interface LED display ➢ Run , Debug and Test the program	▪ Initialize the port ▪ Use Timer for digit scan ▪ Interface LED display ▪ Run , Debug and Test the program
10	Interface a Single DOTMATRIX LCD DISPLAY and display the given number	➢ Initialize the port ➢ Interface LCD display ➢ Run , Debug and Test the program	▪ Initialize the port ▪ Interface LCD display ▪ Run , Debug and Test the program
11	Interface a (3x4 matrix) Key Board to 8051	➢ Initialize the port ➢ Interface Key board ➢ Run , Debug and Test the program	▪ Initialize the port ▪ Interface Key board ▪ Run , Debug and Test the program
12	Control the direction of rotation of a small DC motor via COM port	➢ Initialize the port ➢ Interface Motor to COM port ➢ Run , Debug and Test the program	▪ Initialize the port ▪ Interface Motor to COM port ▪ Run , Debug and Test the program

13	Interface I^2C BUS Device using DS1307 IC .	➢ Interface DS1307 in slave mode for RTC applications ➢ Interface DS1307 in slave mode for RTC applications ➢ Run , Debug and Test the program	▪ Interface DS1307 in slave mode for RTC applications ▪ Run , Debug and Test the program
14	Interface a) ADC IC b) DAC IC	➢ Interface ADC and DAC ICs ➢ Write C program ➢ Run , Debug and Test the program	▪ Interface ADC and DAC ICs ▪ Write C program ▪ Run , Debug and Test the program
15	Connect Microcontroller serial interface to PC COM Port	➢ Interface PC and Microcontroller via com port ➢ Write C program ➢ Run , Debug and Test the program	▪ Interface ADC and DAC ICs ▪ Write C program ▪ Run , Debug and Test the program
16.	**Burn executable code into EPROM**	➢ Load the program into 8051 using EPROM Burner ➢ Load the program into 89C51 using PC	▪ Load the program into 8051 using EPROM Burner ▪ Load the program into 89C51 using PC

PROJECT WORK

Subject Title	**:**	**Project Work**
Subject Code	**:**	**EC- 510**
Periods / Week	**:**	**04**
Periods / Semester	**:**	**60**

Rationale: Project work is intended to provide application level concepts in designing and Implementing suitable solutions to multifarious needs related to Industry as well as Day to day Life . Project work should pave way for i) implementation of Innovative Ideas ii) preparation of prototypes for commercial models.

TIME SCHEDULE

Sl	Major Topics	Periods
	MATLAB PRACTICE	16
1	Literature survey/ Concept modelling ;Prototyping/Reverse Engineering	8
2	Usage of sophisticated equipment	8
3	Abstract submission/ Seminars(One Seminar before approval and one Seminar after completion of the Project)	4
4	Working model of the project	16
5	Testing Performance	4
6	Project report/Documentation/Seminars	4
	Total	**60**

MATLAB Practice

Competencies & Key Competencies to be achieved

Exp No	Name of the Experiment (No of periods)	Competencies	Key Competencies
1	To get familiarized with Matlab environment(3) b. To work with files and directories	➢ Open MatLab ➢ Identify Current folder, Current window , Work space &Command history ➢ Use editor/Debugger to	▪ Identify Current folder, Current window , Work space &Command history ▪ Use editor/Debugger to create a program

		create a program ➢ Use basic commands ➢ Creating Directory, Checking current directory ➢ saving files ➢ Quit Matlab	▪ Use basic commands ▪ Creating Directory, Checking current directory ▪ saving files ▪ ▪
2	To enter an expression and solve (3)	➢ Open Matlab & access the appropriate directory &File ➢ Enter the Expression using Matlab notations and hierarchy ➢ Debug ➢ Solve and verify the results	▪ Enter the Expression using Matlab notations and hierarchy ▪ Debug ▪ Solve and verify the results
3	To solve complex expressions (involving j operator (3)	➢ Open Matlab & access the appropriate directory &File ➢ Enter the Expression using Matlab notations and hierarchy ➢ Debug ➢ Solve and verify the results	▪ Enter the Expression using Matlab notations and hierarchy ▪ Debug ▪ Solve and verify the results
4	To work with arrays and matrices (3) b) To find determinant of a matrix using	➢ Open Matlab & access the appropriate directory &File ➢ Enter the program in	▪ Enter the program in standard format following syntax in text editor

	matlab	standard format following syntax in text editor ➢ Enter a matrix, access an element , a row, a column, ➢ Use colon operator ➢ Use Basic Matrix functions ➢ Debug and Compile ➢ Execute and save with appropriate name	▪ Enter a matrix, access an element , a row, a column, ▪ Use colon operator ▪ Use Basic Matrix functions ▪ Debug and Compile ▪ Execute and save with appropriate name
5	To Solve simultaneous equations using Matlab(3) b) To solve for currents in an electrical circuit using kirchoff's laws using matlab	➢ Open Matlab & access the appropriate directory &File ➢ Re arranging equations in proper order & put in a matrix format ➢ Enter the matrix in standard format following syntax ➢ Debug and Compile ➢ Execute and save with appropriate name	▪ Enter the matrix in standard format following syntax ▪ Debug and Compile ▪ Execute and save with appropriate name
6	To plot a graph between two variables using **plot (x,y)** function(3) b) To plot a sine wave with title & Labels	➢ Open Matlab & access the appropriate directory &File ➢ Enter the function ➢ Add title & labels ➢ Use plot command ➢ Specify line styles &Colours ➢ Add plots to existing	▪ save with appropriate name Enter a matrix, access an element , a row, a column, multiply a matrix with a vector. ▪ ▪ Debug and Compile ▪ Execute and save with appropriate name

		graphs ➢ Debug and Compile ➢ Execute and save with appropriate name	
7	To plot multiple functions and add title and labels(3)	➢ Open Matlab & access the appropriate directory &File ➢ Enter the functions ➢ Add title & labels ➢ Specify line styles &Colours ➢ Add plots to existing graphs ➢ Create multiple plots ➢ Debug and Compile ➢ Execute and save with appropriate name	▪ Enter the functions ▪ Add title & labels ▪ Specify line styles &Colours ▪ Add plots to existing graphs ▪ Create multiple plots ▪ Debug and Compile ▪ Execute and save with appropriate name
8	To use fplot , ezplot and ezsurfc functions b) To publish a report in word file(3)	➢ Open Matlab & access the appropriate directory &File ➢ Enter the functions ➢ Add title & labels ➢ Specify line styles &Colours ➢ Add plots to existing graphs ➢ Use fplot ,ezplot and ezsurfc command s	▪ Enter the functions ▪ Add title & labels ▪ Specify line styles &Colours ▪ Add plots to existing graphs ▪ Use fplot ,ezplot and ezsurfc command s ▪ Debug and Compile ▪ Execute and save with appropriate name

		➢ Debug and Compile ➢ Execute and save with appropriate name ➢ Publish to word file	▪ Publish to word file
9	To Use simulink to verify the function of an amplifier (3)	➢ Open simulink ➢ Access library browser ➢ Identify blocks &terminals ➢ Gather the appropriate Blocks (sine wave , gain , Scope) ➢ Connect blocks ➢ Run simulation	▪ Identify blocks &terminals ▪ Gather the appropriate Blocks (sine wave , gain , Scope) ▪ Connect blocks ▪ Run simulation ▪
10	To use simulink GUI to design 1st order Low pass Filter(3)	➢ Open simulink ➢ Access library browser ➢ Identify blocks &terminals ➢ Gather the appropriate Blocks (sine wave , , Scope etc) ➢ Connect blocks ➢ Run simulation	▪ Identify blocks &terminals ▪ Gather the appropriate Blocks (sine wave , , Scope etc) ▪ Connect blocks ▪ Run simulation ▪

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

Project work should have the following components

1. Literature survey
2. Concept modelling
3. Seminars(One Seminar before approval and one Seminar after completion of the Project)
4. Abstract submission
5. Working model of the project
6. Project report

OBJECTIVES

Upon completion of the course the student should be able to

1.1 Identify different works to be carried out in the Project.
1.2 Collect relevant information required for the project work.
1.3 Carry out Literature survey.
1.4 Select the most efficient method from the available choices based on preliminary investigation.
1.5 Prepare action plan and schedule for project implementation
1.5 Design the required elements of the project work as per standard practices.
1.6 Implement prototype circuits and test
1.7 Design proper enclosure to house the prototype
1.8 Identify the Tests to be carried out for verification of design parameters
1.9 implement project work and record the results at various stages.
1.10 Prepare project report as per the standard guide lines.

COURSE CONTENT

Project work is intended to provide application level concepts in designing and Implementing suitable solutions to multifarious needs related to Industry as well as Day to day Life .

Project work should pave way for i) implementation of Innovative Ideas ii) preparation of prototypes for commercial models.

Students should be formed into groups of five each and shall be assigned a problem that calls for application of the knowledge he/she acquired during the course .The faculty members shall provide necessary and also monitor /assess the project progress. The students may be encouraged to implement projects using Aurdino boards /PIC controllers/ 89C51 / ARM Controllers in the fields of Communication Engineering, Industrial electronics ,Robotics or any other relevant fields. Preparing a working model complete in all respects including proper enclosure, indicators switches, Power cords etc is mandatory.

Every student should prepare a project report and submit the same for assessment which includes his/her contribution in the project work . The end examination in Project work shall consist of Seminar and Viva-voce test to be assessed by a panel of examiners comprising of an External examiner, the Head of Section, and the internal guide.

Other interested faculty members and students may also be invited for attending the seminars.

Scheme of assessment

1)	Seminar1	10 Marks	Internal assessment
2)	Seminar 2	10 Marks	
3)	Project Report/Assessment	20 Marks	External assessment
4)	Project	40 Marks	
5)	Viva-Voce	20 Marks	

	Total Marks	100	

VI SEMESTER

(Industrial Training)

Industrial Training

A sound practical training will inculcate a respect for the value of actual practical work. By such training the individual should come to realize his own limitations and potentialities and gain confidence by developing his interests and aptitudes. It should aid his growth not only as a technician but also as a person, and enable him better to make his unique contribution to industrial society.

1. Experience the discipline of working in a professional engineering organization
2. Develop understanding of the functioning and organization of a business
3. Interact with other professional and non-professional groups
4. Apply engineering methods such as design and problem solving
5.Get exposure to with new tools and materials
6. Follow safety precautions
5. Develop technical, interpersonal and communication skills, both oral and written
6. Other **purposes** of this program include developing the good qualities of integrity, responsibility and self confidence.

Objectives :

Briefly, the Industrial Training program has six (6) main objectives:

- To give students the opportunity to apply the knowledge and skills they have acquired in a real-life work situation.
- To provide students with opportunities for practical, hands-on learning from practitioners in the students' field of study.
- To give students work experience while they are studying their chosen subject.
- To expose students to the work environment, common practices, employment opportunities and work ethics in the relevant field.
- To inculcate soft skills relevant to the needs of employers.
- To provide opportunities for students to be offered jobs in the same organizations where they undergo Industrial Training

Learning Outcomes :

At the end of Industrial Training, students will be able to:

- improve their knowledge and skills relevant to their area of study
- relate the knowledge and skills acquired at the workplace, to their on-campus studies
- compete effectively in the job market, because they have been equipped with the requisite knowledge, skills, attitudes and practical experience