DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING

C-14 Curriculum

Structure of DECE in C-14 Curriculum

Sl No	I YEAR		III SEMESTER		IV SEMESTER		V SEMESTER		VI SEMESTER	
	Sub Code	Subject	Sub Code	Subject	Sub Code	Subject	Sub Code	Subject	Sub Code	Subject
1	EC-101	English	**EC-301**	Mathematics - II	EC 401	Mathematics - III	EC 501	Advanced Communication systems	EC 601	Industrial Management
2	EC-102	Mathematics – I*	EC-302	Electronic Circuits	EC 402	Linear Integrated Circuits	***EC 502***	***Consumer Electronics***	**EC 602**	Industrial Electronics
3	EC-103	Engineering Physics	EC-303	Electronic Measuring Instruments	EC 403	Network Analysis	**EC 503**	Computer Hardware	***EC 603***	***Electronic Product Design &Quality Assurance***
4	EC 104	Engineering Chemistry &Environmental Studies	EC-304	Analogue communication	EC 404	Digital Communication	***EC 504***	***Optical Fibre Communication***	**EC 604**	Mobile Communications
5	EC-105	Basic Electrical &Electronic Engineering	EC-305	Digital Electronics	EC 405	Microprocessor& Microcontroller Programming	***EC 505***	***Microcontroller Applications***	***EC 605***	***Advanced Microcontrollers &DSP***
6	***EC-106***	***Engineering materials &Practices***	***EC-306***	***Electrical Technology***	***EC406***	***Programming in C***	**EC 506**	Data communication& Computer Networking	***EC 606***	***Digital Circuit Design through Verilog HDL***
7	**EC-107**	Engineering Drawing	**EC-307**	EDC lab	EC 407	Linear Integrated Circuits Lab	EC 507	Computer HW +OFC Networking Lab	EC 607	Industrial Electronics Lab
8	EC-108	Basic Electronics workshop	EC-308	Analogue Communication Lab	***EC 408***	***Communication Skills***	***EC 508***	***Life Skills***	***EC 608***	***Verilog HDL Programming***
9	109-A 109-B	Physics Lab Chemistry Lab	***EC-309***	***Digital Electronics &eCAD tools lab***	**EC 409**	**Digital Communication Lab**	***EC 509***	***Microcontroller applications lab***	***EC 609***	***Advanced Microcontroller Lab***
10	EC-110	Computer fundamentals Lab	***EC-310***	***Electrical Lab***	***EC 410***	***C and Matlab***	***EC 510***	***Field practices***	EC 610	**Project work**

DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING

SCHEME OF INSTRUCTIONS AND EXAMINATIONS

(FIRST YEAR)

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical /Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
EC-101	English	3	-	90	3			100
EC-102	Engineering Mathematics - I	5	-	150	3			100
EC-103	Engineering Physics	4	-	120	3			100
EC-104	Engineering Chemistry &Environmental Studies	4	-	120	3			100
EC-105	Basic Electrical & Electronics Engineering	4	-	120	3			100
EC-106	Engineering Materials & Practices	4	-	120	3			100
PRACTICAL:								
EC-107	Engineering Drawing Practice	-	6	180	3			100
EC-108	Basic Electronic Workshop Practice	-	6	180	3			100
EC-109	109-A Engineering Physics Lab practice 109-B Engineering Chemistry Lab practice	-	3	90	3 (1.5+1.5)			100 (50+50)
EC-110	Computer fundamentals Lab practice	-	3	90	3			100
	TOTAL	24	18	1260				1000

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERINGSCHEME OF INSTRUCTIONS AND EXAMINATIONS

III Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / Sem	Scheme of Examination			
		Theory	Practical /Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
EC- 301	Mathematics - II	4	-	60	3	20	80	100
EC -302	Electronic Devices & Circuits	4	-	60	3	20	80	100
EC -303	Electronic Measuring Instruments	4	-	60	3	20	80	100
EC-304	Analogue communication	4	-	60	3	20	80	100
EC-305	Digital Electronics	4	-	60	3	20	80	100
EC-306	Electrical Technology	4	_	60	3	20	80	100
PRACTICAL:								
EC-307	EDC lab	-	6	90	3	40	60	100
EC-308	Analogue Communication Lab	-	3	45	3	40	60	100
EC-309	Digital Electronics & CAD tools lab	-	6	90	3	40	60	100
EC-310	Electrical Technolgy Lab	-	3	45	3	40	60	100
	TOTAL	24	18	630		280	720	1000

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERINGSCHEME OF INSTRUCTIONS AND EXAMINATIONS
IV Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / Sem	Scheme of Examination			
		Theory	Practical /Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
EC - 401	Mathematics - III	4		60	3	20	80	100
EC - 402	Linear Integrated Circuits	5		75	3	20	80	100
EC - 403	Network Analysis	5		75	3	20	80	100
EC - 404	Digital Communications	4		60	3	20	80	100
EC - 405	Microprocessor & Microcontroller Programming	4		60	3	20	80	100
EC - 406	Programming in C	4		60	3	20	80	100
PRACTICAL:								
EC - 407	Linear Integrated Circuits Lab	-	4	60	3	40	60	100
EC - 408	Communication Skills	-	3	45	3	40	60	100
EC - 409	Digital Communication Lab	-	6	90	3	40	60	100
EC - 410	C and Matlab		3	45	3	40	60	100
	TOTAL	26	16	630		280	720	1000

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERINGSCHEME OF INSTRUCTIONS AND EXAMINATIONS

V Semester

Subject Code	Name of the Subject	Instruction		Total Period / Sem	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam	Total Marks
THEORY:								
EC-501	Advanced Communications	4	-	60	3	20	80	100
EC-502	Consumer Electronics	4	-	60	3	20	80	100
EC-503	Computer Hardware	4	-	60	3	20	80	100
EC-504	Optical Fibre Communication	4	-	60	3	20	80	100
EC-505	Microcontroller Applications	4	-	60	3	20	80	100
EC-506	Data communication & Computer Networking	4	-	60	3	20	80	100
PRACTICAL:								
EC-507	Computer HW & Networking Lab	-	6	90	3	40	60	100
EC-508	**Life Skills**	-	3	45	3	40	60	100
EC-509	Microcontroller applications lab	-	3	45	3	40	60	100
EC-510	Field Practices	-	6	90	3	40	60	100
	TOTAL	24	18	630		280	720	1000

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
VI Semester

Subject Code	Name of the Subject	Instruction		Total Period / Sem	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam	Total Marks
THEORY:								
EC- 601	Industrial Management &Entrepreneurship	4	-	60	3	20	80	100
EC-602	Industrial Electronics	4	-	60	3	20	80	100
EC - 603	Electronic Circuit Design &Quality	4	-	60	3	20	80	100
EC - 604	Mobile Communications	4	-	60	3	20	80	100
EC - 605	Advanced Microcontrollers &	4	-	60	3	20	80	100
EC - 606	Digital Circuit Design through Verilog HDL	4	-	60	3	20	80	100
PRACTICAL:								
EC- 607	Industrial Electronics Lab	-	6	90	3	40	60	100
EC -608	VHDL Programming Lab	-	3	45	3	40	60	100
EC -609	Advanced Microcontroller Lab	-	3	45	3	40	60	100
EC -610	Project work	-	6	90	3	40	60	100
	TOTAL	24	18	630		280	720	1000

I YEAR

DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
(FIRST YEAR)

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical /Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
EC-101	English	3	-	90	3			100
EC-102	Engineering Mathematics - I	5	-	150	3			100
EC-103	Engineering Physics	4	-	120	3			100
EC-104	Engineering Chemistry &Environmental Studies	4	-	120	3			100
EC-105	Basic Electrical & Electronics Engineering	4	-	120	3			100
EC-106	Engineering Materials & Practices	4	-	120	3			100
PRACTICAL:								
EC-107	Engineering Drawing Practice	-	6	180	3			100
EC-108	Basic Electronic Workshop Practice	-	6	180	3			100
EC-109	109-A Engineering Physics Lab practice 109-B Engineering Chemistry Lab practice	-	3	90	3 (1.5+1.5)			100 (50+50)
EC-110	Computer fundamentals Lab practice	-	3	90	3			100
	TOTAL	24	18	1260				1000

ENGLISH

(Common to all Branches)

Subject Title : English
Subject Code : EC – 101
Periods per Week **:** 03
Periods per Year **:** 90

Time Schedule

Sl No	Major Topics	No. of Periods	Weightage of Marks	No of Short Answers	No of Long Answers
1	Vocabulary	5	13	1	1
2	Grammar	30	31	7	1
3	Reading	10	10	-	1
4	Writing	30	40	-	4
5	English in Action	15	16	2	1
		90	110	10	08

Rationale and Scope

Globalization has ushered in an era of opportunities for those who have the necessary competencies. Effective communication is one among them. This shift demands strengthening of English in polytechnics. In C-14 Curriculum the focus is on the special English needs of technician studies and training. This course aims at integration of the four fold language abilities viz., listening, speaking, reading and writing. The use of English for learning technical subjects and for performing technical functions like, writing repots, giving instructions and interpreting graphics is of great importance. Therefore the curriculum C-14 focuses on improving communicative abilities equipping the students to become industry- ready and employable.

On completion of this course the student shall be able to:

1.0 Build their vocabulary in the direction of their future needs
2.0 Learn various grammatical structures
3.0 Read and comprehend English and understand the details and draw inferences
4.0 Learn to be competent in various forms of written communication (writing composition and data interpretation)
5.0 Practice spoken communication suited to various situations.

1.0 Extend their vocabulary in the direction of their future needs

1.1 Locate words, learn spellings, understand meanings
1.2 Pronounce words intelligibly
1.3 Find synonyms and antonyms
1.4 Use affixation
1.5 Comprehend meanings of words by understanding meanings of roots

2.0 Learn various grammatical structures

2.1 Identify and use nouns
2.2 Identify and use pronouns
2.3 Use the present tense
2.4 Use the past tense
2.5 Use the future tense
2.6 Identify and use adjectives
2.7 Identify and use adverbs
2.8 Use prepositions
2.9 Use linkers
2.10 State basic sentence structures
2.11 Construct different types of sentences
2.12 Frame questions to elicit information
2.13 Frame questions for conformation
2.14 Use active voice
2.15 Use passive voice
2.16 Use direct speech
2.17 Use indirect speech
2.18 Identify and correct errors

3.0 Read and comprehend English

3.1 Identify the main ideas
3.2 Identify the specific details
3.3 Draw inferences
3.4 Give contextual meanings of the words
3.5 Perceive tone in a text

4.0 Learn to excel in various forms of written communication (writing composition and data interpretation)

4.1 Identify components of a good paragraph
4.2 Write types of paragraphs
4.3 Distinguish between formal and informal letters
4.4 Write personal letters
4.5 Write leave letters
4.6 Write official letters
4.7 Write letters of complaints
4.8 Prepare a resume
4.9 Write a cover letter
4.10 Write short messages
4.11 Report incidents
4.12 Report experiments
4.13 Report Industrial visits
4.14 Write work done statements
4.15 Write maintenance reports
4.16 Make notes using Cue method and Mapping method

4.17 Summarize Paragraphs
4.18 Present and Interpret Data from flow charts, tree diagrams, bar graphs, tables, pie charts

5.0 Practice spoken communication suited to various situations.

5.1 Use appropriate expressions to greet and take leave
5.2 Use proper expressions to make requests
5.3 Use apt expressions for asking and giving directions
5.4 Use suitable expressions to seek and offer suggestions
5.5 Use suitable expressions to state intentions
5.6 Use suitable expressions to state feelings
5.7 Use appropriate expressions to state agreement and disagreement
5.8 Use proper expressions to make complaints
5.9 Use suitable expressions to express obligations

Course Material

The textbook prepared by the faculty of English of Polytechnics in AP.

Reference Books

1. Essential English Grammar (Intermediate Level) Raymond Murphy
2. Learn English (A Fun Book of Functional Language, Grammar and Vocabulary) Santanu Sinha Chaudhuri
3. Grammar Builder (Entire Series) Oxford University Press
4. High School English Grammar (Revised Edition) Wren and Martin
5. Sentence skills with Readings (fourth Edition, Tata McGraw Hill) John Langan, Paul Langan
6. Word Power Made Easy Norman Lewis
7. Spoken English Shashi Kumar and Dhamija

ENGINEERING MATHEMATICS – I

(Common to all Branches)

Subject Title : Engineering Mathematics-I
Subject Code : EC-102
Periods per week : 05
Periods per year : 150

Blue print

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	3	0	0	0	0	0	0	0	0
2	Partial Fractions	5	0	3	0	1	0	0	0	0
3	Matrices and Determinants	10	10	16	2	0	0	0	0	1
	Unit - II : Trigonometry									
4	Trigonometric Ratios	2	0	0	0	0	0	0	0	0
5	Compound Angles	3	2	3	1	0	0	0	0	0
6	Multiple and Submultiple angles	4	4	3	0	1	0	0	0	0
7	Transformations	4	4	5	0	0	0	1/2	0	0
8	Inverse Trigonometric Functions	3	2	5	0	0	0	0	1/2	0
9	Trigonometric Equations	3	2	5	0	0	0	1/2	0	0
10	Properties and solutions of triangles	4	4	5	0	0	0	0	0	1/2
11	Hyperbolic Functions	2	0	0	0	0	0	0	0	0
12	Complex Numbers	4	2	3	1	0	0	0	0	0
	Unit III : Co-ordinate Geometry									
13	Straight Lines	4	2	3	1	0	0	0	0	0
14	Circle	4	2	3	1	0	0	0	0	0

15	Conic Sections	5	4	10	0	0	0	0	1	0
S. No	**Major Topic**	**No of Periods**		**Weightage of Marks**	**Short Type**			**Essay Type**		
Unit – IV : Differential Calculus										
16	Limits and Continuity	4	2	3	0	1	0	0	0	0
17	Differentiation	18	10	23	1	0	0	1	1	0
Unit - V : Applications of Differentiation										
18	Geometrical Applications	3	2	5	0	0	0	0	0	1/2
19	Physical Applications	2	2	5	0	0	0	0	0	1/2
20	Maxima and Minima	3	4	5	0	0	0	0	0	1/2
21	Errors and Approximations	2	0	5	0	0	0	0	0	1/2
	Total	92	58	110	7	3	0	2	2 1/2	3 1/2
				Marks	21	9	0	20	25	35

R: Remembering type 41 marks
U: Understanding type 34 marks
App: Application type 35 marks

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 and

3. Improper

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

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

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

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 Understand Trigonometric Ratios

4.1 Define trigonometric ratios of any angle.

4.2 List the values of trigonometric ratios at specified values.

4.3 Draw graphs of trigonometric functions

4.4 Explain periodicity of trigonometric functions.

5.0 Solve simple problems on Compound Angles

5.1 Define compound angles and state the formulae of sin(A±B), cos(A±B), tan(A±B) and cot(A±B)

5.2 Give simple examples on compound angles to derive the values of $\sin 15^0$, $\cos 15^0$, $\sin 75^0$, $\cos 75^0$, $\tan 15^0$, $\tan 75^0$ etc.

5.3 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc.,

5.4 Solve simple problems on compound angles.

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

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

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

6.3 Solve simple problems using the above formulae

7.0 Apply Transformations for solving the problems in Trigonometry

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

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

8.0 Use Inverse Trigonometric Functions for solving engineering problems

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

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

8.3 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.

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

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

8.6 Solve simple problems.

9.0 Solve Trigonometric Equations in engineering applications

9.1 Explain what is meant by solutions of trigonometric equations and find the general solutions of $\sin x = k$, $\cos x = k$ and $\tan x = k$ with appropriate examples.

9.2 Solve models of the type a $\sin^2 x$ + b sin x +c=0, a cos x + b sin x=c etc., and problems using simple transformations.

10.0 Appreciate Properties of triangles and their solutions

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

10.2 Explain the formulae for sin A/2, cos A/2, tan A/2 and cot A/2 in terms of semi-perimeter and sides a, b, c and solve problems.

10.3 List various formulae for the area of a triangle.

10.4 Solve problems using the above formulae.

10.5 Solve a triangle when (i) three sides, (ii) two sides and an included angle, (iii) two sides and an opposite angle-case of two solutions and (iv) one side and two angles are given.

11.0 Represent the Hyperbolic Functions in terms of logarithm functions

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

11.2 Represent inverse hyperbolic functions in terms of logarithms.

12.0 Represent Complex numbers in various forms

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

12.2 Define the operations on complex numbers with examples.

12.3 Define amplitude of a complex number

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

12.5 State DeMoivre's theorem and its applications to complex numbers e.g., finding the roots, powers, simplifications of a complex number with illustrative examples

UNIT - III

Coordinate Geometry

13.0 Solve the problems on Straight lines

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

13.2 Solve simple problems on the above forms

13.3 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.

14.0 Solve the problems on Circles

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

14.2 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

14.3 Write the general equation of a circle and find the centre and radius.

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

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

15.0 Appreciate the properties of Conics in engineering applications

15.1 Define a conic section.

15.2 Explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.

15.3 Find the equation of a conic when focus, directrix and eccentricity are given

15.4 Describe the properties of Parabola, Ellipse and Hyperbola

15.5 Solve engineering problems in simple cases of Parabola and Ellipse.

UNIT - IV

Differential Calculus

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

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

16.2 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).

16.3 Solve the problems using the above standard limits

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

16.5 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.

17.0 Appreciate Differentiation and its meaning in engineering situations

17.1 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.

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

17.3 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.

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

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

17.6 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)** $\log(\sin(\cos x))$.

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

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

17.9 Find the derivatives of hyperbolic functions.

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

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

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

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

17.14 Explain the definition of Homogenous function of degree n

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

UNIT - V

Applications of the Differentiation

18.0 Understand the Geometrical Applications of Derivatives

18.1 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.

18.2 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.

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

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

19.0 Understand the Physical Applications of Derivatives

19.1 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.

19.2 Explain the derivative as a rate measurer in the problems where the quantities like volumes, areas vary with respect to time- illustrative examples.

20.0 Use Derivatives to find extreme values of functions

20.1 Define the concept of increasing and decreasing functions.

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

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

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

21.0 Use Derivatives to find Errors and Approximations

21.1 Find the absolute error, approximate error, relative error and percentage error in functions of single variable.

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:

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

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

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 Cramers's rule, Matrix inversion method-examples-Elementary row operations on matrices -Gauss-Jordan method to solve a system of equations.

Unit-II

Trigonometry:

4.Trigonometric ratios: definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.

5. Compound angles: Formulas of sin(A±B), cos(A±B), tan(A±B),cot(A±B),and related identities with problems.

6. Multiple and sub multiple angles: trigonometric ratios of multiple angles 2A,3A and submultiple angle A/2 with problems.

7. Transformations of products into sums or differences and vice versa simple problems

8. Inverse trigonometric functions : definition, domains and ranges-basic properties- problems.

9. Trigonometric equations: concept of a solution, principal value and general solution of trigonometric equations :

   sin x =k , cos x= k, tan x =k.

   Solutions of simple quadratic equations, equations involving usage of transformations-problems.

10. Properties and solutions of triangles: relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle- solving a triangle-problems.

11. Hyperbolic functions: Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.

12. Complex Numbers : Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitude (polar) form, Exponential form(Euler) form of a complex number- Problems. DeMoivre's Theorem and its applications in complex numbers- Simple problems.

UNIT-III

Coordinate geometry

13. Straight lines: various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.
14. Circle: locus of appoint, 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.
15. Definition of a conic section, equation of a conic when focus directrix and eccentricity are given. Properties of parabola, ellipse and hyperbola, standard forms - applications of parabola and ellipse to engineering situations.

UNIT-IV

Differential Calculus

16. Concept of Limit- Definition- Properties of Limits and Standard Limits -Simple Problems- Continuity of a function at a point- Simple Examples only.
17. 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, logarthmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables – partial differentiation, Euler's theorem-simple problems.

UNIT-V

Applications of Derivatives:

18. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, subtangent and subnormal to the curve at any point . Angle between the curves - problems.
19. Physical applications of the derivative – velocity, acceleration, derivative as a rate Measure – Problems.

20. 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.
21. Applications of derivative in finding errors and approximations of functions and simple problems.

Reference Books :

1. A text book of matrices by Shanti Narayan,
2. Plane Trigonometry, by S.L Loney
3. Co-ordinate Geometry, by S.L Loney
4. Thomas Calculus, Pearson Addison-Wesley publishers
5. Calculus – I, by Shanti Narayan and Manicavachgam Pillai, S.V Publications

ENGINEERING PHYSICS
(Common to all Branches)

Subject Title : Engineering Physics
Subject Code : EC -103
Periods per week : 04
Total periods per year : 120

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type	Essay Type
1.	Units and Dimensions	08	03	1	-
2.	Elements of Vectors	12	13	1	1
3.	Kinematics	12	13	1	1
4.	Friction	08	10	-	1
5.	Work, Power and Energy	10	10	-	1
6.	Simple Harmonic Motion	12	13	1	1
7.	Heat & Thermodynamics	12	13	1	1
8.	Sound	12	13	1	1
9.	Properties of matter	10	06	2	-
10.	Electricity & magnetism	14	13	1	1
11.	Modern Physics	10	03	1	-
	Total:	**120**	**103**	**10**	**8**

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
1.15 State the limitations of dimensional analysis

2.0 Understand the concept of Elements of Vectors

2.1 Explain the concept of Vectors
2.2 Define Scalar and Vector quantities

2.3 Give examples for scalar and vector quantities
2.4 Represent vectors graphically
2.5 Classify the Vectors
2.6 Resolve the vectors
2.7 Determine the Resultant of a vector by component method
2.8 Represent a vector in space using unit vectors (I, j, k)
2.9 State triangle law of addition of vectors
2.10 State parallelogram law of addition of vectors
2.11 Illustrate parallelogram law of vectors in case of flying bird and sling.
2.12 Derive expression for magnitude and direction of resultant of two vectors
2.13 State polygon law of addition of vectors
2.14 Explain subtraction of vectors
2.15 Define Dot product of two vectors with examples (Work done, Power)
2.16 Mention the properties of Dot product
2.17 Define Cross products of two vectors with examples (Torque, Linear velocity)
2.18 Mention the properties of Cross product.
2.19 Solve the related numerical problems

3.0 Understand the concept of Kinematics

3.1 Recapitulate the equations of motion in a straight line
3.2 Define acceleration due to gravity
3.3 Derive expressions for
a) Maximum Height, b) time of ascent, c) time of descent, and d) time of
3.4 Derive height of a tower when a body projected vertically upwards from the top of a tower.
3.5 Define projectile motion with examples
3.6 Explain Horizontal projection
3.7 Derive an expression for the path of a projectile in horizontal projection
3.8 Explain oblique projection
3.9 Derive an expression for the path of projectile in oblique projection
3.10 Derive formulae for
a)Horizontal Range, b)Maximum range of a projectile in oblique projection
3.11 Solve the related numerical problems

4.0 Understand the concept of Friction

4.1 Define friction
4.2 Classify the types of friction
4.3 Explain the concept of Normal reaction
4.4 State the laws of friction
4.5 Define coefficients of friction
4.6 Explain the Angle of friction
4.7 Derive an expression for acceleration of a body on a rough horizontal surface
4.8 Derive an expression for the displacement and time taken to come to rest over a rough horizontal surface
4.9 Define Angle of repose
4.10 Derive an expressions for acceleration of a body on a smooth inclined plane (up and down)
4.11 Derive an expressions for acceleration of a body on a rough inclined plane (up and down)
4.12 List the Advantages and Disadvantages of friction
4.13 Mention the methods of minimizing friction

4.14 Solve the related numerical problems

5.0 Understand the concept of Work, Power, and Energy

5.1 Define work
5.2 State SI units and dimensional formula for work
5.3 Define power
5.4 State SI units and dimensional formula for power
5.5 Define energy
5.6 State SI units and dimensional formula for energy
5.7 Define potential energy
5.8 Derive the expression for Potential energy with examples
5.9 Define kinetic energy
5.10 Derive the expression for kinetic energy with examples
5.11 State the Work- Energy theorem
5.12 Explain the relation between Kinetic energy and momentum
5.13 State the law of conservation of energy
5.14 Verify the law of conversion of energy in the case of a freely falling body
5.15 Solve the related numerical problems

6.0 Understand the concept of Simple harmonic motion

6.1 Define Simple harmonic motion
6.2 State the conditions of Simple harmonic motion
6.3 Give examples for Simple harmonic motion
6.4 Show that the tip of the projection of a body moving in circular path with uniform speed is SHM
6.5 Derive expression for displacement
6.6 Derive expression for velocity
6.7 Derive expression for acceleration
6.8 Derive expression for Time period and frequency of S H M
6.9 Define phase of S H M
6.10 Derive expression for Time period of simple pendulum
6.11 State the laws of simple pendulum
6.12 State the laws of Seconds pendulum
6.13 Solve the related numerical problems

7.0 Understand the concept of Heat and thermodynamics

7.1 Explain the concept of expansion of gases
7.2 Explain Boyle' s law
7.3 State Charles law in terms of absolute temperature
7.4 Define absolute zero temperature
7.5 Explain absolute scale of temperature
7.6 Define ideal gas
7.7 Derive ideal gas equation
7.8 Define gas constant and Universal gas constant
7.9 Explain why universal gas constant is same for all gases
7.10 State SI unit of universal gas constant
7.11 Calculate the value of universal gas constant
7.12 State the gas equation in terms of density
7.13 Distinguish between r and R
7.14 Explain Isothermal process with the help of P-V and T-Ø diagram
7.15 Explain adiabatic process with the help of P-V and T-Ø diagram
7.16 Distinguish between isothermal and adiabatic process

7.17 State first and second laws of thermodynamics
7.18 Define specific heats & molar specific heats of a gas
7.19 Derive the relation $C_p - C_v = R$
7.20 Solve the related numerical problems

8.0 Understand the concept of Sound

8.1 Define the term sound
8.2 Explain longitudinal and transverse wave motion
8.3 Distinguish between musical sound and noise
8.4 Explain noise pollution and state SI unit for noise
8.5 Explain causes of noise pollution
8.6 Explain effects of noise pollution
8.7 Explain methods of minimizing noise pollution
8.8 Explain the phenomenon of beats
8.9 List the applications of beats
8.10 Define Doppler effect
8.11 List the Applications of Doppler effect
8.12 Explain reverberation and reverberation time
8.13 Write Sabine's formula
8.14 Explain echoes
8.15 State conditions of good auditorium
8.16 Solve the related numerical problems

9.0 Understand the properties of matter

9.1 Define the term Elasticity
9.2 Define the terms stress and strain
9.3 State the units and dimensional formulae for stress and strain
9.4 State the Hooke's law
9.5 Define the surface tension
9.6 Explain Surface tension with reference to molecular theory
9.7 Define angle of contact
9.8 Define the capillarity
9.9 Write the formula for surface tension based on capillariy
9.10 Explain the concept of Viscosity
9.11 Provide examples for surface tension and Viscosity
9.12 State Newton's formula for viscous force
9.13 Define co-efficient of viscosity
9.14 Explain the effect of temperature on viscosity of liquids and gases
9.15 State Poiseulle's equation for Co-efficient of viscosity
9.16 Solve the related numerical problems

10.0 Understand the concept of Electricity and Magnetism

10.1 Explain the concept of Electricity
10.2 State the Ohm's law
10.3 Explain the Ohm's law
10.4 Define specific resistance, conductance and their units
10.5 State Kichoff's laws
10.6 Explain Kichoff's laws
10.7 Describe Wheatstone's bridge with legible sketch
10.8 Derive expression for balancing condition of Wheatstone's bridge

10.9 Describe Meter Bridge with legible sketch
10.10 Write the formula for Meter Bridge to determine specific resistance
10.11 Explain the concept of magnetism
10.12 State the Coulomb's inverse square law of magnetism
10.13 Define magnetic field and magnetic lines of force
10.14 State the Magnetic induction field strength-units and dimensions
10.15 Derive Magnetic induction field strength at a point on the axial line
10.16 Describe the moment of couple on a bar magnet placed in a uniform magnetic field
10.17 Derive Magnetic induction field strength at a point on the equatorial line
10.18 Solve the related numerical problems

11.0 Understand the concept of Modern physics

11.1 Explain Photo-electric effect
11.2 Write Einstein's photoelectric equation
11.3 State laws of photoelectric effect
11.4 Explain the Working of photoelectric cell
11.5 List the Applications of photoelectric effect
11.6 Recapitulate refraction of light and its laws
11.7 Define critical angle
11.8 Explain the Total Internal Reflection
11.9 Explain the principle and working of Optical Fiber
11.10 Mention types of optical fibers
11.11 List the applications of Optical Fiber
11.12 Define super conductor and superconductivity
11.13 List the examples of superconducting materials
11.14 List the applications of superconductors

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- Advantages and limitations of Dimensional analysis- - Problems.

2. 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

3. 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

4. Friction:

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

5. 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

6. Simple Hormonic 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

7. Heat and Thermodynamics:

Expansion of Gases- Boyle's law- Absolute scale of temperature- Charles 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

8. Sound:

Sound- Nature of sound- Types of wave motion - usical 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

9. **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

10. Electricity & Magnetism:

Ohm's law and explanation- Specific resistance- Kirchoff's laws- Wheatstone's bridge- Coulomb's inverse square law magnetic field- magnetic lines of force- Magnetic induction field strength- magnetic induction field strength at a point on the axial line - magnetic induction field strength at a point on the equatorial line –problems.

11. 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 and working of an optical fiber-types of optical fibers - Applications of optical fibers- concepts of superconductivity - applications

REFERENCE BOOKS

1. Intermediate physics Volume-I — Deepthi
2. Unified physics Volume 1,2,3 and 4 — Dr.S.L Guptha and Sanjeev Guptha
3. Text book of physics Volume I — Resnick & Holiday
4. Text book of applied physics — Dhanpath Roy
5. Fibre optics — D.A Hill

Blue Print for setting question paper at different levels

S.No	Major Topics	No. of Periods	Weightage of Marks	Short answer type			Essay type		
				K	U	A	K	U	A
1.	Units and Dimensions	08	03	1	0	0	0	0	0
2.	Elements of Vectors	12	13	0	0	1	0	1	0
3.	Kinematics	12	13	0	1	0	1	0	0
4.	Friction	08	10	0	0	0	0	1	0
5.	Work, Power and Energy	10	10	0	0	0	0	1	0
6.	Simple Harmonic Motion	12	13	0	0	1	0	1	0
7.	Heat & Thermodynamics	12	13	0	1	0	1	0	0
8.	Sound	12	13	0	1	0	0	0	1
9.	Properties of Matter	10	06	1	1	0	0	0	0
10.	Electricity & magnetism	14	13	0	1	0	0	1	0
11.	Modern Physics	10	03	1	0	0	0	0	0
	Total:	**120**	**110**	**3**	**5**	**2**	**2**	**5**	**1**

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES
(Common to all Branches)

Subject Title : Engineering Chemistry & Environmental Studies
Subject Code : EC -104
Periods per week : 04
Total periods per year : 120

Blue Print

S.No	Major topic	No of Periods	Weightage of marks	Short type (3marks)			Essay type (10 marks)			remarks
				R	U	A	R	U	A	
A. ENGINEERING CHEMISTRY										
1	Fundamentals of Chemistry	18	16	1	0	1	0	1	0	
2	Solutions	10	8	1	0	0	0	0	1/2	5 mark
3	Acids and bases	10	8	0	0	1	0	1/2	0	5 mark
4	Principles of Metallurgy	10	10	0	0	0	1	0	0	
5	Electrochemistry	14	13	0	1	0	0	0	1	
6	Corrosion	8	10	0	0	0	0	1	0	
7	Water Technology	14	13	1	0	0	1	0	0	
8	Polymers	12	13	1	0	0	1	0	0	
9	Fuels	6	3	1	0	0	0	0	0	
B. ENVIRONMENTAL STUDIES		18	16	1	1	0	0	1	0	
	total	120	110	6	2	2	3	3 1/2	1 1/2	
				18	6	6	30	35	15	

OBJECTIVES

Upon completion of the course the student shall be able to

A. ENGINEERING CHEMISTRY

1.0 Understand the concept of Atomic structure

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 atomic theory and its limitations

1.4 Explain the concept of Quantum numbers with examples

1.5 Explain 1.Aufbau's principle, 2.Hund's rule and 3.Pauli's exclusion principle with respect to electron stability

1.6 Define Orbital in an atomic structure

1.7 Draw the shapes of s, p and d Orbitals in an atomic structure

1.8 Distinguish between Orbit and Orbital

1.9 Write the electronic configuration of elements up to atomic number 30

1.10 Explain the significance of chemical bonding

1.11 Explain the Postulates of Electronic theory of valance

1.12 Define the four types of Chemical bonding viz.,Ionic, Covalent, Coordinate and Metallic

1.13 Explain the four types of Chemical bonding viz.,Ionic, Covalent, Coordinate and Metallic

1.14 Explain bond formation in NaCl and MgO

1.15 List Properties of Ionic compounds

1.16 Explain bond formation in Hydrogen molecule, Oxygen molecule, and Nitrogen molecule using Lewis dot method

1.17 List Properties of Covalent compounds

1.18 Explain Metallic bond with Electron sea model theory

1.18 Define the terms 1.Oxidation, 2.Reduction and 3.Oxidation number

1.19 Calculate the Oxidation Number

1.20 Differentiate between Oxidation Number and Valence

2.0 Calculate Molarity, Molality and Normality of given Solution

2.1 Define the terms 1.Solution, 2.Solute and 3.Solvent

2.2 Classify solutions based on physical state and solubility

2.3 Define mole

2.4 Explain, with examples, the 'Mole concept'

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

2.6 Calculate Molecular weight and Equivalent weight of given Acids, Bases and Salts

2.7 Define 1.Molarity, 2. Molalty and 3.Normality of solutions

2.8 Explain with examples Normality

2.9 Solve Numerical problems on Mole, Molarity and Normality

3.0 Understand the concepts of Acids and bases

3.1 Explain Arrhenius theory of Acids and Bases

3.2 State the limitations of Arrhenius theory of Acids and Bases

3.3 Explain Bronsted – Lowry theory of acids bases

3.4 State the limitations of Bronsted – Lowry theory of acids 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

3.11 Give the at least three examples foe buffer solutions

3.12 State the applications of buffer solution

4. 0 Understand the Principles of Metallurgy

4.1 List at least eight Characteristics of Metals

4.2 Distinguish between Metals and Non Metals

4.3 Define the terms 1.Mineral, 2.Ore, 3. Gangue, 4. Flux and 5. Slag

4.4 Describe the methods of concentration of ore like 1.Hand picking,2. Levigation, and 3. Froth Floatation

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

4.6 Explain the purification of Metals by Electrolytic Refining

4.7 Define an Alloy

4.8 Write the Composition of the following alloys:1.Brass, 2.German silver, and Nichrome

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

5.0 Understand the concepts of Electrochemistry

5.1 Define the terms1. conductor, 2. Insulator, 3.Electrolyte and 4.Non – electrolyte

5.2 Distinguish between metallic conduction and Electrolytic conduction

5.3 Explain Arrhenius theory of electrolytic dissociation

5.4 Explain electrolysis by taking example fused NaCl

5.5 Explain Faraday's laws of electrolysis

5.6 Define 1.Chemical equivalent and 2.Electrochemical equivalent

5.7 Solve the Numerical problems based on Faraday's laws of electrolysis

5.8 Define Galvanic cell

5.9 Explain the construction and working of Galvanic cell

5.10 Distinguish between electrolytic cell and galvanic cell

5.11 Explain the standard electrode potentials

5.12 Explain the electrochemical series and its significance

5.13 Explain the emf of a cell

5.14 Solve the numerical problems on emf of cell

6.0 Understand the concept of Corrosion

6.1 Define the term corrosion

6.2 Explain the Factors influencing the rate of corrosion

6.3 Explain the concept of electrochemical theory of corrosion

6.4 Describe the formation of a) composition cells, b) stress cells c) concentration cells

6.5 Explain the mechanism of rusting of iron

6.6 Explain the methods of prevention of corrosion: a) Protective coatings

b) Cathodic protection (Sacrificial anode process and Impressed – voltage process)

7. 0 Understand the concept of Water Technology

7.1 State the various Sources of water like Surface and sub surface sources

7.2 Define the terms soft water and hard water with respect to soap consumption

7.3 Define the term of hardness of water

7.4 Explain the various types of hardness of water like temporary and permanent hardness; and carbonate and bicarbonate hardness of water.

7.5 List the usual compounds causing hardness (with Formulae)

7.6 State the disadvantages of using hard water in industries

7.7 Define Degree of hardness, units of hardness (mg/L)

7.8 Explain the methods of softening of hard water: a) Ion-Exchange process, b)Reverse osmosis process(RO)

7.9 List the advantages of RO

7.10 State three essential qualities of drinking water like

1).Safety, 2). Economy and 3)..Aesthetic

8.0 Understand the concepts of Polymers

8.1 Explain the concept of polymerisation

8.2 Describe the methods of polymerisation a) addition polymerisation of Ethylene b) condensation polymerisation of phenol and formaldehyde (Only flow chart i.e. without chemical equations)

8.3 Define the term plastic

8.4 Classify the plastics with examples

8.5 Distinguish between thermo and thermosetting plastics

8.6 List the Characteristics of plastics

8.7 State the advantages of plastics over traditional materials

8.8 State the disadvantages of using plastics.

8.9 Explain the methods of preparation of the following plastics:

1. Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde

8.9 Explain the uses of the following plastics:

1. Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde

8.10 Define the term natural rubber

8.11 State the structural formula of Natural rubber

8.12 Explain the processing of Natural rubber from latex

8.13 List the Characteristics of natural rubber

8.14 Explain the process of Vulcanization

8.15 List the Characteristics of Vulcanized rubber

8.16 Define the term Elastomer

8.17 Describe the preparation of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c) Neoprene rubber

8.18 List the uses of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c) Neoprene rubber

9.0 Understand the concepts of Fuels

9.1 Define the term fuel

9.2 Classify the fuels based on physical state – solid, liquid and gaseous fuels,

9.3 Classify the fuels based on occurrence- primary and secondary fuels

9.4 List the characteristics of good fuel

9.5 State the composition and uses of gaseous fuels:
a) water gas, b) producer gas, c) natural gas, d) coal gas, e) Bio gas and f) acetylene

B. ENVIRONMENTAL STUDIES

1.1 Define the term environment

1.2 Explain the scope and importance of environmental studies

1.3 Explain the following terms 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4).Biosphere, 5)Pollutant, 6).Pollution, 7).Contaminant receptor - sink, particulates, dissolved oxygen, 8).Threshold limit value, 9).BOD, and 10).COD

1.4 Explain the growing energy needs

1.5 State the differences between renewable and non renewable energy sources-alternative energy sources.

1.6 Define an Ecosystem- biotic component, abiotic component and energy component,

1.7 Define the terms:
1).Producers, 2).Consumers and 3).Decomposers with examples.

1.8 Explain biodiversity and threats to biodiversity

1.9 Define air pollution

1.10 Classify the air pollutants- based on origin and state of matter

1.11 Explain the causes of air pollution

1.12 Explain the use and over exploitation of forest resources and deforestation

1.13 Explain the effects of air pollution on human beings, plants and animals

1.14 Explain the green house effect - ozone layer depletion and acid rain

1.15 Explain the methods of control of air pollution

1.16 Define water pollution

1.17 Explain the causes of water pollution

1.18 Explain the effects of water pollution on living and non living things

1.19 Understand the methods of control of water pollution.

COURSE CONTENT

A. ENGINEERING CHEMISTRY

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 – types of chemical bonds – Ionic and covalent bond with examples – Properties of Ionic and Covalent compounds
– Metallic bond

Oxidation-Reduction: Concepts of Oxidation-Reduction, Oxidation Number- calculations, differences between Oxidation Number and Valency

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. Principles of Metallurgy

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

5. 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 –emf and numerical problems on emf of a cell

6. Water technology

Introduction –soft and hard water – causes of hardness – types of hardness
–disadvantages of hard water – degree of hardness (ppm) – softening methods – permutit 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

7. Introduction - factors influencing corrosion - electrochemical theory of corrosion - composition, stress and concentration cells– rusting of iron and its mechanism – prevention of corrosion by coating methods, cathodic protection

8. Polymers

Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials

– Disadvantages of using plastics – preparation and uses of the following plastics: 1. Polytehene 2. PVC 3. Teflon 4. Polystyrene 5. Urea formaldehyde – Rubber – Natural rubber – processing from latex –Vulcanization – Elastomers – Butyl rubber, Buna-s, Neoprene rubber and their uses.

9. Fuels

Definition and classification of fuels – characteristics of good fuel - composition and uses of gaseous fuels.

B. ENVIRONMENTAL STUDIES

Introduction – environment –scope and importance of environmental studies important terms – renewable and non renewable energy sources – Concept of ecosystem, producers, consumers and decomposers – Biodiversity, definition and threats to Biodiversity.

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

REFERENCE BOOKS

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

Basic Electrical & Electronics Engineering

Subject Title : Basic Electrical & Electronics Engineering
Subject Code : EC-105
Periods/Week : 04
Periods/Year : 120

TIME SCHEDULE

Sl. No	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Basic Electricity Work power and energy	24	13	1	1
2	Magnetism	10	8	1	1/2
3	Electrostatics & Capacitance	16	13	1	1
4	Chemical effects of electric current & Batteries	6	8	1	1/2
5	AC Fundamentals	10	13	1	1
6	Passive components	18	13	1	1
7	Switches and Relays	10	13	1	1
8	PCBs	8	8	1	1/2
9	Semiconductor Diode	6	8	1	1/2
10	Power supplies	12	13	1	1
	Total	120	110	10	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 Electric Charge and Electrostatic Field

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 Define di-electric strength and di-electric constant
3.10 Give the Permittivity of commonly used die- electric materials
3.11 Define the term capacitance.
3.12 Draw the symbol of capacitor
3.13 State unit of capacitance
3.14 Derive the formula for capacitance of a parallel plate capacitor
3.15 Explain equivalent capacitance of
A. Capacitors connected in series;
B. Capacitors connected in parallel
3.16 Explain charging and discharging of capacitor.
3.17 Give the expression for energy stored in a capacitor
3.18 Solve simple problems related to capacitors

4.0 Chemical effects of Current and Batteries

4.1 Explain Faradays laws of Electrolysis
4.2 Explain Polarisation or Back emf
4.3 Explain how the value of Back emf can be determined
4.4 Define Primary and Secondary Cells.
4.5 Explain series and parallel connections of cells to form Battery
4.6 Give the formulae for output voltage and current when connected in 1. Series and 2. Parallel

4.7 Explain when it is preferred to have 1. Series connection 2. Parallel connection of the batteries
4.8 Explain the constructional details of a Lead acid Battery
4.9 List the active materials used in the construction of lead acid Battery
4.10 Explain the chemical reactions that take place during Charging and discharging
4.11 Explain the significance of internal resistance of a Battery
4.12 Define the Ampere Hour and Watt Hour Efficiencies of the cell.
4.13 Draw the Electrical characteristics of Lead acid cell and explain.
4.14 Explain the condition of a Fully charged cell.
4.15 List the six important applications of Lead acid batteries
4.16 Explain constant current and Constant Voltage methods of Charging Lead acid batteries.
4.17 Solve simple problems to find charging current requirements
4.18 Explain the need for Trickle charging
4.19 Explain the sulphation and its prevention
4.20 List the precautions to be observed to maintain the lead acid batteries.
4.21 Explain the Constructional details of lithium ion Batteries
4.22 List any 4 merits and demerits of Lithium Ion Batteries
4.23 List all the precautions to be taken when charging and discharging of lithium ion batteries
4.24 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)
4.25 Mention the output voltages of above cells
4.26 Mention the Common and IEC standard codes to specify the size of the cell
4.27 Mention any 3 applications of the above
4.28 Compare Primary and Secondary cells.

5.0 Understand the concept of Alternating current

5.1 Explain the generation of Alternating current with simple loop generator concept.
5.2 Draw the sine wave and explain the concept of a cycle
5.3 Define Time period , Frequency and Amplitude of a sine wave
5.4 Give the formula for the instantaneous value in terms of maximum value, frequency and time.
5.5 Write different forms of emf equation
5.6 Solve simple problems to calculate Amplitude ,frequency and Time Period
5.7 Define the average value, R.M.S. value, form factor and peak factor for sine wave.
5.8 Explain the terms phase and phase difference.
5.9 Explain the concept of Leading , lagging and inphase with the help of waveforms
5.10 Explain vector representation of Alternating quantities
5.11 Draw the vector diagrams of sine waves of same frequency.
5.12 Perform addition and subtraction of alternating quantities using vector method.
5.13 Solve problems to find resultant vector of several alternating quantities**.**
5.14 Explain the effect of AC flowing through Pure Resistance , Inductance and Capacitance with vector diagrams.
5.15 Define the terms Inductive reactance, Impedance, admittance, conductance and Power Factor
5.16 Explain Active and Reactive components of AC current
5.17 Explain Active and Reactive and apparent power in AC circuit.
5.18 Explain the importance of power factor
5.19 Define **Q factor** of a coil.

5.20 Explain power in an iron cored choking coil.
5.21 Explain AC through Resistance and capacitance connected in series.
5.22 Solve simple problems on RC series circuits
5.23 Calculate the impedance, power, current, phase angle and power factor in RL,RC and RLC series circuits.

6.0 Understand passive components

6.1 Classify types of resistors.
6.2 List the specifications of a resistor, and state their importance.
6.3 Explain the necessity of preferred values in resistor.
6.4 Explain the features of following Resistors.
  a. Carbon Film Resistors
  b. Metal film Resistors
  c. Metal oxide Resistors.
  d. Precision Resistors
6.5 List the applications of the above Resistors
6.6 Identify Resistance Value by using Colour Code.(4band and 5 band)
6.7 List the common faults in resistors.
6.8 Classify wire wound Resistors
6.9 Explain the constructional details of wire wound resistors.
6.10 List any 4 applications of Wire wound Resistor Including Fan Regulator
6.11 List the two types of Variable resistors (Potentiometer and Preset)
6.12 Distinguish between Preset and Potentiometer
6.13 Draw the European and US standard symbols of Potentiometers and Presets
6.14 Describe constructional details of carbon and wire wound potentiometers.
6.15 Compare the features of carbon and wire wound potentiometers
6.16 List different types of Presets and Trimmers
6.17 Mention any 3 applications of precision multi turn Cermet trimmer
6.18 Mention the need for tapering in potentiometers.
6.19 Define Linear and Logarithmic Potentiometers
6.20 Explain the use of Logarithmic potentiometer in Audio amplifier for Volume control
6.21 Explain the construction and working of rheostat
6.22 Explain the use of Rheostat as 1. Variable Resistance. 2. Potentiometer
6.23 List the 4 types of special Resistors (Thermistor , Sensistor, LDR and VDR)
6.24 Explain P.T.C. and N.T.C. of Resistors.
6.25 Explain the working of thermistor and sensistor
6.26 Give standard specifications for the above
6.27 List any 3 applications. of above
6.28 Give Constructional details of LDR (Light Dependant Resistor)
6.29 List 3 important specifications of LDR
6.30 List any 3 applications of LDR
6.31 Explain the use of VDR
6.32 Explain resistor packs and SMD Resistors

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

6.33 Classify inductors.
6.34 Draw the symbol of different types of inductors

6.35 List the specifications of inductors.
6.36 List and Explain the important parameters of Air cored inductors
6.37 Explain the terms Stray inductance and stray capacitance
6.38 List various core materials used in the construction of inductors
6.39 Describe the constructional features
6.40 List the applications of A.F. and R.F chokes.
6.41 List the common faults in inductors
6.42 Explain the use of Ferrites in the construction of high frequency inductors

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

6.43 Classify the different types of capacitors.
6.44 List the specifications of a capacitor and state their importance.
6.45 Explain different markings on the a) Electrolytic capacitors b) Ceramic and Plastic capacitors (Value , Polarization, Voltage, Tolerance , temperature rating)
6.46 Explain working voltage of a capacitor
6.47 Reading the capacitor value and tolerance by 1. Using colour code. 2.Value printed
6.48 State the factors affecting the capacitance of a capacitor.
6.49 Mention the properties, range of values and applications of
1. Paper 2. mica, 3. glass, 4. polyester 5. Polystyrene 6. ceramic 7. Electrolytic capacitors.
6.50 Explain the importance of polarity in Electrolytic capacitors
6.51 Explain the use of capacitors for coupling AC signal and blocking DC
6.52 Explain self healing in metalized capacitors
6.53 List different types of variable capacitors and mention their applications.
6.54 Explain the use of ganged capacitor in AM radio for tuning
6.55 Explain the use of trimmer capacitors
6.56 Mention the losses in capacitors.
6.57 List 3 common faults in capacitors.

7.0 Familiarise with different types of switches, Connectors and Relays.

7.1 Explain the working of a switch.
7.2 Classify switches according to poles and throws (SPST, SPDT, DPST, DPDT, Multi-pole multi-throw)
7.3 Explain the working of toggle, push button, rotary, slider, keyboard, and thumb wheel switches with a mention to their ratings and applications.
7.4 Draw the I.S.I symbols of various switches.
7.5 Explain the need of fuse in electronic equipment.
7.6 Mention different types of fuses.
7.7 List 3 metals used for fuses
7.8 Mention significance of fuse ratings.
7.9 Explain the need for connectors in electronic circuits.
7.10 List different types of connectors.
7.11 Mention the use of MCB.
7.12 Define an Electromagnetic relay.
7.13 Draw the symbol of a relay
7.14 Classify different relays based on principle of operation, polarization and application.
7.15 Mention specifications of relays.

7.16 Explain the construction & working of general-purpose electromagnetic relay.
7.17 Explain the purpose of NC and NO contacts
7.18 Explain arcing during changeover
7.19 List the contact materials used in relays and list their characteristics.
7.20 Explain the use of solenoid
7.21 Explain the need for fly back diode across the relay coil when used in electronic circuits
7.22 Distinguish between relay and contactor

8.0 Comprehend PCB materials and their fabrication

8.1 Explain the need of PCB in electronic equipment.
8.2 Classify PCBs.
8.3 List types of laminates used in PCBs.
8.4 Mention the methods of layout preparation of PCB.
8.5 List the methods of transferring layout on the copper clad sheet.
8.6 List the steps involved in screen-printing for making PCBs.
8.7 List the materials used in screen-printing.
8.8 Describe the photo processing techniques for PCB preparation.
8.9 Mention the methods of etching, cleaning and drilling of PCB.
8.10 Describe the steps involved in making double-sided PCB.
8.11 Give the standard specification for PCB
8.12 Explain the need for multilayer PCBs
8.13 Explain the use of Surface mount Technology (SMT)
8.14 List the materials used in soldering.
8.15 List the soldering methods of PCBs.

9.0 Understand the working of Semiconductor Diodes

9.1 State the electrical properties of solid Semiconductor materials.
9.2 Sketch energy level diagrams for conductors, Semiconductors, Insulators.
9.3 Distinguish between Intrinsic and extrinsic Semiconductors.
9.4 Describe the formation of P type and N type materials and sketch the energy band diagrams.
9.5 Explain Majority and Minority carriers in P and N Type materials.
9.6 Distinguish between Drift and Diffusion current.
9.7 Explain the formation of PN junction diode.
9.8 Describe the working of PN junction Diode with various biasing voltages.
9.9 Explain the forward/Reverse Bias Voltage characteristics of diode.
9.10 Interpret the manufacturer specifications of a given diode from data sheet.
9.11 Describe the formation and working of Zener diode.
9.12 Explain the characteristics of Zener diode.
9.13 Distinguish between Zener breakdown and Avalanche breakdown.

10.0 Understand the working of DC Power Supplies

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

10.2 Describe the working of HW, FW and Bridge section circuits with wave forms
10.3 Give the equations for RMS value, average DC value; ripple factor and efficiency for the above circuits.
10.4 Define Voltage Regulation.
10.5 Explain the need for a filter circuit in power supplies.
10.6 Explain the operation of a rectifier circuit using RC, CRC, CLC filters.
10.7 State the need for a regulated power supply and list its specifications.
10.8 Explain the working of a simple Zener regulated DC Power supply.

COURSE CONTENT

1. 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

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 - di-electric

strength and di-electric constant- Permittivity of commonly used die- electric materials - capacitance- symbol of capacitor- Unit of capacitance- Formula for capacitance of a parallel plate capacitor- equivalent capacitance of Capacitors connected in series &Capacitors connected in parallel- Charging and discharging of capacitor- Expression for energy stored in a capacitor- Simple problems related to capacitors.

4.Chemical effects of electric current

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.

5. 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.

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.

6.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- 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- Resistor packs and SMD Resistors

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

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.

7. 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

8. 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) -Materials used in soldering- soldering methods

9. Semiconductor diodes:

Electrical properties of semiconductor materials, energy level diagrams of conductor, semi conductor 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

10. DC Power supplies

Need of DC power supply- Half wave, Full wave and Bridge rectifiers. RMS value, Ripple factor, Voltage regulation. Filters – RC, CRC, and CLC. Zener regulator – series and shunt. IC regulators and specifications of RPS

RECOMMENDED BOOKS

1. A Textbook of Electrical Technology

Basic Electrical Engineering (Volume1) by BL Theraja &AK Theraja Chand Publications

2. Basic Electrical Engineering Volume 1 by PS Dhogal , TMH
3. Electronic devices and applications by B. Somanathan Nair, PHI.
4. 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

EC-106 ENGINEERING MATERIALS AND PRACTICES

Subject Title : Engineering Materials & Practices
Subject Code : EC-106
Periods/Week : 04
Periods/year : 120

Rationale ; The knowledge of Engineering materials & workshop practices is indispensible to a diploma holder in Electronics &Communication engineering as per the expectations of the industry **.**With the lean staff concept in the industry ,Technicians working at supervisory level must be versatile and possess interdisciplinary skills. Care has been taken to introduce most essential and latest topics in the subject which will enhance their understanding of other subjects in future courses.

Time Schedule

S No	Major topics	No of periods	Weightage of marks	Short answer questions	Essay questions
1	Classification of materials and properties of conductors	20	**16**	2	**1**
2	Properties and applications of Insulating materials	20	**16**	**2**	**1**
3	Properties and applications of magnetic materials	20	**13**	**1**	**1**
4	Properties and applications of Special materials	12	**13**	**1**	**1**
5	Introduction to Workshop processes	12	**13**	**1**	**1**
6	Important machines used in the workshops	12	**13**	**1**	**1**
7	Fastening	12	**13**	**1**	**1**
8	Soldering Brazing and Welding				
9	Heat treatment				
10	Electrical hazards- First Aid and safety	12	**13**	**1**	**1**
	Total	120	**110**	**10**	**8**

OBJECTIVES.

On completion of the study the student will be able to

1.0 Understand the Classification of 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 how the resistance of a conductor is affected by presence of impurities
1.7 Classify the conducting material as low resistivity and high resistivity materials
1.8 List the 4 Metals commonly used in Electrical and Electronics fields .
1.9 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
1.10 List the Electrical properties of Copper (conductivity, resistivity, temperature coefficient) of copper.
1.11 Explain the mechanical properties of copper
1.12 Explain general properties like conductivity, resistivity, temperature coefficient, Solderability.
1.13 Explain general properties like conductivity, resistivity, corrosion, temperature Coefficient and mechanical properties of Steel.
1.14 List 6 important Uses of different conductors in electronics engineering,.
1.15 Define corrosion.
1.16 List four methods to prevent corrosion of conductors.
1.17 Explain the process of anodization of Aluminum

2.0 Understand General Properties of Insulating materials;

2.1 Define Insulating Materials.
2.2 State the important electrical properties of Insulating materials.
2.3 Define Insulating resistance ,Volume and Surface resistance
2.4 Explain factors affecting insulating resistance.
2.5 Classify Insulating materials on the basis of temperature like Y,A,E,B,F,H and C class.
2.6 Mention the properties of Impregnated paper, Wood, Cardboard, Asbestos, Mica, Ceramics and Glass.
2.7 List the uses of above insulating materials
2.8 Explain Thermoplastic & Thermosetting resins with examples.
2.9 Explain the properties & applications of PVC

3.0 Comprehend Magnetic Materials

3.1 Classify the magnetic Materials (Ferromagnetic, Paramagnetic, Diamagnetic and Ferrimagnetic)
3.2 Define the above magnetic materials.
3.3 Define Soft and Hard magnetic materials
3.4 Distinguish between soft and Hard magnetic Materials
3.5 Give 3 examples for each.
3.6 List the important magnetic materials used in the Electrical &Electronic industry
3.7 List the important properties of Magnetic materials
3.8 Explain the effect of temperature on magnetism
3.9 Define the curie point
3.10 Explain the terms Hysteresis and Hysteresis loss
3.11 Explain the use of Soft Magnetic Materials like Silicon sheet steel for transformers,.
3.12 Explain the merits of Cold rolled grain oriented steels for transformer

4.0 Understand the use of Special Materials and alloys

4.1 Define an alloy
4.2 Explain the need for alloying.
4.3 List the 6 important alloys used in electrical engineering
4.4 Explain about low resistivity copper alloys: Brass, Bronze

4.5 Explain the use of cadmium copper and Beryllium copper
4.6 List alloys used for Bimetallic strips , soldering and fuse material,
4.7 Give the combination of manganin, constantin, Nichrome, and solder metal
4.8 Mention the uses of above alloys.
4.9 Explain the use of Nickel-iron alloys,
4.10 Define ceramic material.
4.11 Explain the use of ceramics for making insulators.
4.12 List 6 applications of ceramic materials in the electrical engineering.
4.13 Define ferrites
4.14 List the important properties of Ferrites
4.15 Mention important uses of above materials
4.16 Explain the composition of Neodymium.
4.17 List any 3 important applications of Neodymium magnets
4.18 Explain superconductivity phenomenon.
4.19 List 3 superconducting metals
4.20 Mention the 3 applications of superconductivity.

5.0 Understand various Workshop practices and Hand Tools

5.1 Explain the use of Engineers Files
5.2 Show the parts of a file with a sketch.
5.3 List various Files used in the workshop
5.4 Mention their usage.
5.5 Explain the precautions to be taken in handling and maintenance of files.
5.6 Explain the use of Hacksaw
5.7 Show the parts of hacksaw with a sketch.
5.8 List the types of Hacksaw blades
5.9 Explain the choice of above blades.
5.10 Explain the use of Cold Chisels
5.11 List the types of cold chisels
5.12 List the types of hammers.
5.13 Explain the parts of Ball peen hammer with a sketch.
5.14 Explain the use of Screw drivers.
5.15 List the types of Screw Drivers used in the workshop.
5.16 Explain the use of Taps and Dies

Explain the use of Cutting tools and Cutting Fluids

5.17 List the 6 important types of Cutting tool materials.
5.18 Explain the use of 1. High speed steels 2. Stelite 3.Cemented carbide 4. Ceramic 5. Cubic Boron nitride 6. Diamond. For cutting tools.
5.19 Explain the need for cutting fluids
5.20 List the 5 types of cutting fluids
5.21 Mention the precautions to be taken while handling cutting fluids.

6.0 Understand the use of Machines Used in the workshop

6.1 List the important Operations carried out in the workshop 1. Drilling 2.Turning 3. Grinding 4. Milling
6.2 Name the machines used to carry out the above operations.
6.3 Name the various parts of a drilling machine and mention their purpose.
6.4 List the cutting tools used with drilling machine.
6.5 Explain the use of twist drill and Reamer.
6.6 Explain Countersunk and Counter bore operations

6.7 Explain how sheet metal drilling is carried out.
6.8 Explain How Plastic drilling is carried out.
6.9 Explain the process of Turning.
6.10 List the parts of Centre Lathe machine.
6.11 Explain the parts of Centre Lathe machine and their functions.
6.12 Explain the use of Face plate.
6.13 List the 6 important operations of lathe machine
6.14 Explain the operations 1. Turning 2. Drilling 3. Reaming 4. Boring 5. Taper turning.6. Thread cutting
6.15 Explain the purpose of grinding
6.16 List the parts of surface grinding machine
6.17 Explain the functions of above.
6.18 Mention the two Abrasive materials used for grinding wheels and explain the importance of grain size and grade.
6.19 Explain the milling operation.
6.20 List the Three types of Milling machines.
6.21 List the parts of Milling machines with a sketch.
6.22 Mention the purpose of above parts.

7.0 Comprehend the use of Mechanical Fasteners

7.1 List the Four types of Mechanical Fasteners 1. Screws Bolts, Nuts and Rivets.
7.2 Classify machine screws based on the types of screw Head
7.3 Explain the use of Socket screws and Self tapping screws
7.4 Explain the use of Bolts and Nuts
7.5 List different types of Nuts used in the industry.
7.6 Explain the Purpose of washers
7.7 List different types of screw threads
7.8 Explain the use of Self locking screws and Bolts.
7.9 Explain the use of locking Nuts
7.10 Explain thread locking.
7.11 Explain the use of Locking washers.
7.12 Mention the 4 types of Locking washers and circlips.
7.13 Explain the process of Riveting
7.14 Mention any 4 advantages of Riveting
7.15 Mention the applications of Rivets.
7.16 List the metals used for riveting
7.17 Explain how electrical connections are secured using mechanical fastening devices
7.18 Explain the use of Bullet connector for Automobile Electrical connections.
7.19 Explain the use of Adhesives for joining
7.20 Explain the advantages of joining parts by using adhesives
7.21 Mention the demerits of adhesives.
7.22 Classify adhesives
7.23 Explain the use of Thermoplastic Resins.
7.24 Explain the use of cyanoacrylate (Superglue)
7.25 Explain Thermosetting Resins
7.26 Explain the use of Epoxys

8.0 Understand the processes Soldering, Brazing and Welding

8.1 Explain the process of soft soldering.
8.2 Explain the use of flux in soldering
8.3 Explain the Heating requirements in the soldering process.

8.4 List three types of soldering joints for joining Electrical conductors.
8.5 Explain the metals and their mix ratios used in producing solder alloys.
8.6 Explain Eutectic point of metals.
8.7 Mention the Tin Lead ratios for a) general purpose Electrical soldering b) Plumber solder and dipping baths.
8.8 Explain the process of Brazing.
8.9 Explain alloys used for brazing. brass and Silver Brazing
8.10 Explain the purpose of flux in Brazing.
8.11 Name the Fluxes used in Brazing
8.12 Mention heat sources suitable for brazing
8.13 Explain with a sketch the joint designs suitable for brazing
8.14 List any 4 applications of Brazing.
8.15 Explain the process of welding
8.16 Mention the two types of Welding
8.17 Explain the process of Arc Welding
8.18 Explain the Process of Gas welding.
8.19 Mention the applications of Arc and Gas welding.

9.0 Understand the purpose of Heat treatment of Steel
9.1 Explain the Process of Heat treatment.
9.2 List the desirable mechanical properties of steel
9.3 Explain the properties , Hardness , Toughness, Brittleness , Strength, Ductility, Malleability
9.4 Elasticity and toughness
9.5 With a Graph explain the relation between Critical temperature and carbon content
9.6 Explain the process of annealing
9.7 Explain the process of Normalizing
9.8 Explain the process of Hardening
9.9 Explain the process of surface hardening
9.10 Explain the process of Tempering

10.0 Understand Electrical Hazards – First aid and Safety
10.1 Explain the importance of safety in the industry.
10.2 Explain the major hazards which may arise from the use of electrical equipment
10.3 Explain the precautions to be taken to prevent accidents while using Machines
10.4 Explain how human body may act as a part of the circuit and cause Electrical shock
10.5 Explain method of first aid treatment for someone suffering from electric shock.
10.6 State general electrical safety rules
10.7 Explain the safety signs and colors
10.8 Show various safety symbols and explain their meaning.
10.9 Explain the causes of Fire and fire accidents in industry.
10.10 Explain Fire prevention measures.
10.11 List 4 types of Portable fire extinguishers
10.12 Explain the choice of above extinguishers.
10.13 Explain the First aid treatment in the case of burns

Course Content

1. Classification of materials

Atomic structure of the atom - Electronic structure of the atom - Energy band diagram - Types of materials –Conductors- Insulators& Semiconductors-Effect of impurities - Metals commonly

used in Electrical and Electronics - Mechanical properties of materials - Electrical and mechanical & General properties of Copper - Mechanical properties of Steel - Uses of different conductors in electronics engineering - Corrosion and methods to prevent corrosion.- Anodization of Aluminum

2. Insulating Materials

Insulating Materials - Electrical properties of Insulating materials - Insulating resistance, Volume and Surface resistance - Factors affecting insulating resistance - Types of Insulating materials on the basis of temperature like Y, A, E, B, F, H and C class - Properties of Impregnated paper, Wood, Cardboard, Asbestos, Mica, Ceramics and Glass and uses of these insulating materials - Thermoplastic & Thermosetting resins - Properties & applications of PVC

3. Magnetic Materials

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 - Use of Soft Magnetic Materials like Silicon sheet steel for transformers - Merits of Cold rolled grain oriented steels for transformer

4. Special Materials

Alloys - Important alloys used in electrical engineering - Low resistivity copper alloys: Brass, Bronze - Use of cadmium copper and Beryllium copper - Alloys used for Bimetallic strips, soldering and fuse material - Combination alloys of manganin, constantin, Nichrome, and solder metal and their uses - Uses of Nickel-iron alloys - Ceramic material - Applications of ceramic materials in the electrical engineering - Ferrites - Important properties of Ferrites - Composition of Neodymium - Applications of Neodymium magnets - Superconductivity phenomenon - Superconducting metals - Applications of superconductivity.

5. Introduction to Workshop practices and Hand Tools

Engineers Files - Parts of a file - Files used in the workshop and their usage - Precautions to be taken - Hacksaw - Parts of hacksaw - Types of Hacksaw blades - Choice of Hacksaw blades - Types of Cold Chisels and their uses - Types of hammers - Parts of Ball peen hammer – Types of Screw drivers and their uses - Taps and Dies and their uses - Types of Cutting tools & Cutting Fluids and their uses **-** Precautions to be taken while handling cutting fluids.

6. Machines Used in the workshop

Operations carried out in the workshop 1. Drilling 2.Turning 3. Grinding 4. Milling - Machines used - Parts of a drilling machine – Types of cutting tools used with drilling machine - Twist drill and Reamer - Countersunk and Counter bore operations - Sheet metal drilling - Plastic drilling - Process of Turning - Parts of Centre Lathe machine and their functions - Face plate - Important operations of lathe machine – Turning, Drilling, Reaming, Boring, Taper turning and Thread cutting - Parts of surface grinding machine and their functions - Abrasive materials used for grinding wheels - Importance of grain size and grade – Types of Milling machines - Parts of Milling machines and their functions

7. Mechanical Fasteners

Types of Mechanical Fasteners - Screws Bolts, Nuts and Rivets – Classification of machine screws - Use of Socket screws and Self tapping screws - Use of Bolts and Nuts - Different types of Nuts used in the industry - Purpose of washers - Different types of screw threads - Use of Self locking screws and Bolts - Use of locking Nuts - Thread locking - Use of Locking washers - Types of Locking washers and circlips – Riveting and advantages of Riveting - Applications of Rivets - Metals used for riveting - Mechanical fastening devices electrical connections - Use of Bullet connector for Automobile Electrical connections - Use of Adhesives for joining - Advantages of joining parts by using adhesives - Demerits of adhesives - Use of Thermoplastic Resins - Use of cyanoacrylate (Superglue) - Thermosetting Resins - Use of Epoxys

8. Soldering, Brazing and Welding

Soldering - Use of flux in soldering - Heating requirements in the soldering process - Types of soldering joints - Metals and their mix ratios used in producing solder alloys - Eutectic point of metals - Electrical soldering and Plumber soldering – Brazing and alloys used for brazing - Brass and Silver Brazing - Fluxes used in Brazing - Applications of Brazing – Types of Welding and their applications

9. Heat treatment of Steel

Heat treatment of Steel – Steel properties: Hardness, Toughness, Brittleness, Strength, Ductility and Malleability - Elasticity and toughness - Critical temperature and carbon content – Different processes: Annealing, Normalizing, Hardening, Surface Hardening and Tempering

10. 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

RECOMMENDED BOOKS

1. Material science for Electrical and Electronic engineers by Ian p.Jones
2. Elements of Workshop Technology. Vol. I: Manufacturing Processes Edition 4 by S K Hajra Choudhury & A K Choudhury – J.K. Pubs., Limited
3. Workshop processes, practices and Materials by Bruce J. Black
4. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers,New Delhi
5. Engineering Materials properties and selection by Kennith G Budinski, Prentice Hall, New Delhi.

ENGINEERING DRAWING PRACTICE

Subject Title : Engineering Drawing Practice
Subject Code : EC–107
Periods/Week : 06
Periods Per Year : 180

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	5	1	-
4	Dimensioning Practice	01	09	5	1	-
5	Geometrical constructions	03	21	15	1	1
6	Projection of points, Lines, Planes & Solids	03	21	10	-	1
7	Auxiliary views	01	06	5	1	-
8	Sectional views	01	27	10	-	1
9	Orthographic Projection	01	33	10	-	1
10	Pictorial drawing	01	30	10	-	1
11	Development of surfaces	01	21	10	-	1
Total		**14**	**180**	**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 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 two 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 08 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)
Drawing Plate -9: Having problems of projection of solids (10 exercises)

7.0 Understand the need of auxiliary views

7.1 State the need of Auxiliary views for a given engineering drawing.
7.2 Draw the auxiliary views of a given engineering component
7.3 Differentiate between auxiliary view and apparent view

Drawing plate No.10: (Having 4 exercises)

8.0 Appreciate the need of Sectional Views

8.1 Explain the need to draw sectional views.
8.2 Select the section plane for a given component to reveal maximum information.
8.3 Explain the positions of section plane with reference planes
8.4 Differentiate between true shape and apparent shape of section
8.5 Draw sectional views and true sections of regular solids discussed in **6.0**
8.6 Apply principles of hatching.

Drawing Plate–11: Having problems of section of solids (6 exercises)

9.0 Apply principles of orthographic projection

9.1 Explain the principles of orthographic projection with simple sketches.
9.2 Draw the orthographic view of an object from its pictorial drawing.
9.3 Draw the minimum number of views needed to represent a given object fully.

Drawing Plate 12 : (Having 10 to 12 exercises)

10.0 Prepare pictorial drawings

10.1 State the need of pictorial drawings.
10.2 Differentiate between isometric scale and true scale.

10.3 Prepare Isometric views for the given orthographic drawings.

Drawing plate 13: (Having 10 to 12 exercises)

11.0 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. 14: (Having 05 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.	Auxiliary views	• Draw the auxiliary views of a given Engineering component • Differentiate between Auxiliary view and apparent view
8.	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
9.	Orthographic Projection	• Draw the minimum number of views needed to represent a given object fully.
10.	Pictorial drawing	• Differentiate between isometric scale and true scale. • Draw the isometric views of given objects,.

11.	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 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 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.

8.0 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

9.0 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.

10.0 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

11.0 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 Electronic Workshop Practice

Subject title : Basic Electronic Workshop Practice
Subject code : EC-108
Periods per week : 6
Periods / Semester : 180

TIME SCHEDULE

Sl NO	Major Topics	Periods
1	**Safety precautions and cleaning**	**3**
	Identification of different Tools and Materials and their working	**33**
2	Identification of wires, cables , House wiring &Troubleshooting	**36**
3	Study and use of Electronic equipment	**12**
4	Testing of Electronic components	**42**
5	Soldering practice & Preparation of PCB	**30**
6	**Group Project**	**24**
	Total Periods	**180**

List of the Experiments

I. Identification of different Tools and Materials and their working

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

II. Identification of different wires, cables and House wiring

13. To Identify different wires and cables
14. To Practice wire joints
15. To Practice Termination of wires
16. To identify the Electrical accessories and their terminals
17. To Identify the mains supply Phase ,Neutral ,Ground By observation and testing
18. To verify the difference between AC and DC by Experimenting with 12 V battery &Transformer

19. To Identify and Draw the electrical symbols of the corresponding component /item
20. To Make simple switch connections using low voltage transformer and 12V lamp
21. To Make either of two lamps glow by two way switch
22. To assemble and connect Tube light set(To be done in the presence of Instructor)
23. To Troubleshoot electrical appliances

III. Study and use of Electronic equipment

24. To Identify electronic equipment and draw their circuit Symbols
25. To Work with Multimeter (Both Digital and analog)
26. To Connect batteries in series and parallel and observe the output voltage using DMM
27. To use the CRO and Function Generator to observe the signal and measure Voltage

IV. Testing of Electronic components

28. To identify and work with Resistors
29. To Measure DC Voltage and DC current using Voltmeter , ammeter &Multimeter
30. To Verify Ohms Law and kirchoff's laws
31. To Measure Resistance using Voltmeter and DRB
32. To Verify the laws of Resistance using a nichrome wire and Multimeter
33. To Verify the effect of temperature on Resistance Using electric lamp , Multimeter, Voltmeter and Ammeter
34. To Verify voltage and current relationship in series and parallel resistive circuits.
35. To Wind coils using winding machine and test
36. To Experiment with transformer
37. To Identify and find the value of different types of capacitors
38. To verify the behaviour of capacitor
39. To determine the component type (Black box testing)using multimeter and power supply
40. To Identify different switches &their terminals
41. To Connect a Fan regulator & switch to ceiling fan and test
42. To Test the given relay and identify NO and NC Contacts
43. To Identify the Bimetallic strip (used in Iron box) and observe its construction

VI. Soldering practice & Preparation of PCB

44. To Practice Soldering
45. To Practice Desoldering using Desoldering Wick and Desoldering Pump
46. To Use and populate General purpose PCB
47. To Identify and fix different types of connectors
48. To connect Public Address system and test
49. To Connect audio video equipment and LCD projector Tuning TV and test
50. To Connect the computer hardware (keyboard, mouse etc)
51. Group Project:

Competencies and Key competencies to be achieved by the student

ExpNo	Name of the Experiment (No of Periods)	Competencies	Key Competencies
1	Demonstrate the safety precautions and first aid (1 ½)	a) Follow the Precautions in the laboratory ,(starting and Stopping of equipment / Machinery) b)Identify the symbols and their meaning c) Identify the types of emergencies d) Follow the sequence of steps to be carried out e) Demonstrate basic first aid procedure	a) Take precautions to prevent accidents in the laboratory b) Alert under emergency situations c) Give Basic first aid.
2	To Clean the equipment and Work Tables including Visual inspection and reporting any physical damage (1 ½))	a)Keep work area clean b)Familiarization with equipment c)Follow the procedure for cleaning with Detergents, Shampoos and solvents. d) Follow the precautions to be taken (use of masks, Gloves, Washing hands with soda after cleaning the equipment)	a)Clean the equipment with appropriate cleaning agent. b)Report any damage of power cords , missing fuses , Low battery in DMMS etc.
3	To Practice with Measuring and Marking Tools (3)	a)Use 1.Measuring Tape 2. Steel rule 3.Trysquare 4. Center Punch 5. Plumb b)Use the measuring tape to measure a distance of 6 feet and above accurately and mark. c) Use the steel rule to measure an odd length given in inches and in millimeters accurately and mark. d) Use the Try square to mark perpendicular lines by selecting a finished edge. e) Use the centre punch to mark centre points as per the drawing f) Use the plumb to observe 1) inclination of wall ii) mark two horizontal points on a wall at a given height and at a given distance.	a)Use the right measuring/ marking tool carry out measurements and marking with precision b)Select right tool
4	To Work with different types	a)Select right screw driver	a)Select right screw

	of screw Drivers. (3) a) Identify 1. Screw Driver a) b) Flat Head Screwdrivers c) Ratcheting Screwdrivers c) Use the Screw Driver to Remove and Fix wooden Screws d)To Fix and Remove screws of Metal cabinets using correct screw Driver	Tightening and removing screws b)Work with wood and metal c)Handle the screw drivers with care	driver b)Tighten and remove the screws
5	To Work With Basic tools (6) 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 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	a) identify and select the right Hacksaw frame and blade b) Fix the hacksaw blade c) Use the hacksaw for cutting metal d) Use bench vice for fixing the job e) Use hammer with skill	a)Select Right tool for a particular situation b) Use the tools with skill c) Fix the hacksaw blade d) Use the hacksaw for cutting metal e) Use hammer with skill
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.	a)Select right tool, b)Remove the insulation without damaging the conductor using 1) Pocket knife 2) Wire stripper c)Measure the wire Gauge d)Fix a screw in the wall.	a)Remove the insulation b)measure the wire Gauge c) Fix a screw in the wall. d)Use Rawl plug jumper

	e) Make a hole in the wall for fixing a Screw/ Nail using Raw plug Jumper and ball peen Hammer.		
7	To Work with different fastening devices, spanners, wrenches and Allen/ Hex keys (3) 1. Identification of 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	a)identify various fastening devices by their name and shape b)Select the right fastener c)Use the spanner for tightening and loosening the bolts and nuts d)Use the Monkey Wrench and Pipe wrench to Tighten GI pipe coupling	a)Use the fastening devices b)Work with bots , nuts and couplings
8	To Work with Pliers (3) 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	a)identify various types of {Pliers by their name and shape b)Select the right pliers for a particular job c)Perform various operations using pliers	a)Use the suitable pliers for a given job
9	To Work with Drilling Machine . (3) 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 steel Plates	a)Identify the parts of Drilling Machine and drill bits used with hand drilling machine b)Fix the drilling bit in the chuck c) Follow Safety precautions d)Make the drill with precision	a)Use the drilling machine to make holes
10	To Identify and observe the function of Grinding machine , Lathe machine , Milling machine and Blower. (3)	a) Identify Grinding machines and observe its usage to sharpen cutting tools and Drill bits and for cutting operation on metals. b) Identify Lathe machine and observe various	a)Identify the machine and its function. b)Identify the processes carried out on the job

		operations like turning , taper turning , Knurling , Boring Etc c) Identify the milling machine and Know its usage. d) identify the Electric Blower and use it for Removing dust and cleaning	
11	To Work with 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	a)Practice joining using different adhesives b)Select right adhesive c)Use *Quickfix* and *Feviquick* to fix components on PCBs	a)Join the parts using Araldite, Mseal etc. b)Use *Quickfix* and *Feviquick* to Fix components on PCBs
12	To Identify conductors insulating materials semiconductors and magnetic materials like (3) 1. Copper , Aluminum , Tin ,Solder Metal . 2. Plastics, Teflon, PVC, glass, porcelain, ceramic Bakelite, Mica, Paper, Cotton sleeves, Prespahn sheet, Transformer Oil. Etc 3. Carbon rods 4. Iron , Steel, Ferrites	a)Identify the Copper , aluminum , iron and other metals by physical observation b)Identify the Insulating materials by their name and physical observation	a)identify different conducting and Insulating materials
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	a) Identify the wires by their technical names b) Identify the gauge of the wire c) Identify the insulation used and its purpose d) Identify the difference between single strand and Multistrand wire e) Select a wire for a particular application f) Find the current carrying capacity from the gauge of wire (refer to the standard tables)	a) Identify the type of wire and its current carrying capacity b) Measure the wire gauge

14	To Practice wire joints (3) To perform the following wire joints operations a) 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	a) Identify the types of joints and state their purpose. b) Select the right joint c) Remove the insulation d) Make the joint e) Tape the joint	a) Make the joint professionally and tape
15	To Practice Termination of wires (1 ½) a) Using lugs Using screws , nuts Terminal blocks Fixing Fuse wire	a) Identify different types of terminal blocks b) Make connections using lugs,Screws c) 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	a) Identify different electrical accessories b) Identify the item by its shape c) Use appropriate electrical accessories	a) Select appropriate Electrical accessories. b) make connections professionally c) 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	a) Follow Precautions Identification of Phase Neutral and Earth terminals in mains supply by b) 1 observation 2 Using Tester 3 Using Test Lamp 4) Using DMM c) Make 2pin and 3pin Plug connections d) Make Power socket and switch connections e) Test the earth connection	a) Identify phase and Neutral terminals in mains supply with tester b) Identify Earth connections with Test lamp
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 6. To observe AC waveform	a) To Check the polarity of DC voltage source b) Find the polarity in DC circuits by using DMM/ multimeter c) Observe the AC signal on CRO	a) Check the source type (AC/DC) using DMM / Multimeter b) Finding polarity in DC circuits c) Use the CRO to observe waveform

	on CRO using a Low voltage Transformer		
19	To Identify and Draw the electrical symbols of the corresponding component /item(1 ½)	a) Identify the physical component from the symbol	a) 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	a) Make the simple Switch connections b) use the two way switch for stair case wiring and c) Series and parallel connection of lamps	a) Use the switch for controlling lamp circuits a) 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 arrangement (using a series lamp / using a Diode) 6.either two lamps bright or two lamps dim	a) Make two way Switch circuit connections b) Use two way switch for controlling lamps.	a) Use two way switch circuits for controlling different circuits and 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	a) Identify the parts of tube light set b) Make tube light connections c) Identify the Choke and starter d) Observe the behavior of tubelight under low voltage conditions e) Open and observe the construction of choke f) g) Verify the purpose of starter h) Observe the CFL lamp	a) Make tube light connections
23	To Troubleshoot electrical appliances (15) , like a) Electric Iron b) heating coil c) Electric Heater d) Air cooler	a) Identify the problem in Electrical gadgets by testing it with b) a) physical observation c) b) Troubleshoot d) i. Using tester ii. Using test Lamp	a) Identify and rectifythe problem in Electrical Gadgets
24	To Identify electronic equipment and draw their circuit Symbols(3)	a) Draw the symbols used in Electronic Circuits b) Identify the meters and	a) Identify and draw the symbols used in Electronic Circuits

	. 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	equipment c) Use DRB, DIB and DCB d) Set the required voltage On power supply	b) Identify the meters and equipment c) Use DRB, DIB and DCB d) Set the required voltage On power supply
25	To Work with Multimeter (Both Digital and analog) (3) a)To Measure resistance of a wire/Component using multimeter b) To check continuity with multimeter c)To Measure Battery Voltage using Voltmeter and Multimeter	a) Identify analog and Digital multimeters b) Zero adjusting analog multimeter c) Select the correct Range d) Measuring Voltage , Current and Resistance with Multimeter	a) Use the Multimeter to measure Voltage, current , Resistance by choosing correct range and mode.
26	To Connect batteries in series and parallel and observe the output voltage using DMM (3)	a) Measure DC voltage with DMM b) Test the cells c) practice Series and Parallel connection of Cells d) Observe the polarity e) observe the effect on Terminal Voltage	a) Make series and parallel connection of batteries b) Use DMM to measure Voltage
27	To use the CRO and Function Generator to observe the signal and measure Voltage (3)	a) Connect function generator to CRO with BNC connector b) Adjust front panel controls c) Measure the voltage	Measure the AC/DC signal Voltage using CRO
28	Toidentify & 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 c) To Connect resistors in series and parallel and measuring the resistance using multimeter d) To make Rheostat connections	a) Identify different types of resistors b) Find the value of Resistance from colour code of CFR and MFR types c) Use resistor combination to get desired resistance d) Identify the terminals on Rheostat e) Set the Rheostat to Minimum and maximum positions f) Observe Resistance change using DMM	a) Identify resistance type by observation b) Finding the value of Resistance from colour code of CFR ang MFR types c) Set the Rhrostat to Minimum and maximum positions
29	To Measure DC Voltage and DC current (3) b) To measure Voltage	a) Connect Voltmeter and Ammeter to measure DC Voltage and Current using	a) measure DC Voltage and Current using Voltmeter and

	&current using Multimeter	Voltmeter and Ammeter b) Measure Voltage &Current using Multimeter	Ammeter
30	To Verify Ohms Law and Kirchoffs laws(3)	a) verify ohms law& Kirchoff's laws and establish relation between Voltage current and Resistance	a) Practically verify the relation between Voltage current and Resistance
31	To Measure Resistance using Voltmeter and DRB (1 ½)	a) Use the DRB b) Apply Ohms law in practical situations	a) Measure the Resistance using Voltmeter and DRB
32	To Verify the laws of Resistance using a nichrome wire and Multimeter(1 ½)	a) verify the laws of Resistance experimentally b) Measure resistance using Multimeter	a) Use the multimeter to measure Resistance
33	To Verify the effect of temperature on Resistance Using electric lamp ,Multimeter, Voltmeter and Ammeter (3)	a) Measure Resistance using multimeter by selecting correct range b) Observe the difference between Cold Resistance and Hot Resistance	a) Measure Voltage current and resistance
34	To Verify voltage and current relationship in series and parallel resistive circuits(3)	a) Observe branch currents in series Parallel circuits b) Verifying current division in parallel circuits with calculated values	a) Measure currents and Voltages and draw inferences
35	To Wind coils using winding machine (3) .a) To Make an Electromagnet and testing it on a DC power supply.	a) use Coil winding Machine and wind a coil of required number of turns b) Make an electromagnet c) Observe the relation between Current , Number of turns and Power of magnet	a) Wind the coil and Test it
36	To Experiment with transformer (3) 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	a) Identify the transformer type based on tappings b) i. Center tapped ii. Multi tapped iii. Normal c) Test the given transformer using a multimeter identify the windings d) Find the Transformation ratio e) Verify step up or step down action of transformer	a) Identify the type of transformer b) Test the transformer with multimeter
37	To Identify and find the value of different types of capacitors (1 ½) a) Find the	a) Identify different types of capacitors by their name b) Read the specifications and Ratings	a) Identify capacitor type b) Read the value of capacitor

	value/specifications of capacitor from Value printed ,and from Color code	c) Find the value of capacitor from the color code	c) Test the capacitor
38	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 (Transfomer / Function generator) and headphones	a) Verify the behavior of capacitor by experimentation b) Connect Capacitors in series and parallel and observing the effect on total capacitance c) Test the capacitor using multimeter and other methods	a) Verify the behavior of capacitors b) c) Connect capacitors in series parallel combination to get desired value d) e) Test the capacitors
39	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	a) Identify a given component by testing with DMM and power supply	a) Identify a given component by testing with DMM and power supply b)
40	To Identify different switches &their terminals (3) a) Identify different types of switches and their symbols b) To use Toggle switches Rotary switches, Push button switches, DIP switches b)To Control a small Tape - recorder motor with a DPDT switch to run in forward and Reverse Directions.	a) Identify different types of switches by observation , By name and symbol b) Use DPDT switch to reverse the Direction Tape recorder motor c) Observe the constructional details and ratings of tape recorder motor	a) Identify the type of switch and its name b) Use DPDT switch c) Test switches using DMM
41	To Connect a Fan regulator & switch to ceiling fan and test(3) a)To observe the rotary switch connections and power Resistors	a) Identify and Use the Rotary switch b) Read the Fan Regulator circuit c) Make Fan Regulator connections d) Identify the type of Resistors used in the Fan Regulator	a) Make Fan Regulator connections
42	To Test the given relay and identify NO and NC Contacts(3) b) To Use the relay to control a lamp load	a) Observe the constructional details of Relay b) Test /identify the coil connections with Multimeter	a) Make relay connections b) Test and use the relay

	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	c) Use the relay in practical circuits	
43	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	a) Identification of Bimetallic Strip b) Verify the behavior of Bimetallic strip c) Observe the constructional details of tube light starter d) Use bimetallic strip in practical circuits	a) Identify Bimetallic strips b) Use the Bimetallic strips in practical applications.
44	To Practice Soldering (9) by I. Making wire tips II. joining wires III. joining components IV. populating simple circuits like, Audio amplifier) on a breadboard b)To test the soldered connections using multimeter	a) Check whether a metal is solderable b) Check solder specifications c) use the Flux in soldering Practice the soldering d) check the soldered joint by physical observation and Multimeter	a) Practice soldering b) Populate PCBs c) Test the PCB tracks with DMM
45	To Practice Desoldering using Desoldering Wick and Desoldering Pump(3)	a) Desolder using b) a) Desoldering Wick c) b)Desoldering Pump	a) Desolder using Wick and Pump
46	To Use and populate General purpose PCB (6) a) To work with solder less bread board	a) Bend the components b) Design the component lay out c) Form common Ground d) Populate the circuit e) Cut and join the tracks wherever necessary f) Use the correct colour code for wires g) Work with solderless bread board	a) Bend the component leads As per layout design b) Use correct colour code for wires c) Work with solderless Bread board
47	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	a) Identify different types of connectors used in electronic circuits by their name b) Select the right connector and terminal blocks based on the requirements	a) Identify different types of connectors used in electronic circuits by their name and use them in the circuits b) Select the right connector

	Board , Flat cable connectors Keyed connectors for microphone Male and Female types f) Lugs , Blade connectors, Ring and spade terminals etc		c) Fix the wire terminals. d) Connect lugs by crimping and soldering
48	To connect Public Address system and test(3)	a) Make amplifier and speaker connections b) Observe Impedance matching c) Use the various front panel and back panel controls	a) Connect the amplifier , microphone and speakers
49	To Connect audio video equipment and LCD projector Tuning TV and test (3)	a) Identify user controls on the equipment b) Set up the LCD projector using menu control/ Remote control c) Identify audio video sockets on LCD projector /TV monitor/DVD player d) Connect audio video cable to the Monitor/ Projector to the DVD / Settop box and testing	a) Set up the projector using menu control/ Remote control b) Tune the TV receiver/ set top box
50	To Connect the computer hardware (keyboard, mouse etc) (3) a) connect computer to LCD projector	a) Connect the basic computer Hardware CPU , Keyboard , Mouse etc b) Identify the ports on CPU c) Connect Speakers to the computer) d) Identify Computer Power switch and various ports on CPU e) Identify various computer cables f) Connect mouse & keyboard g) Connect headphones /speakers/ Microphone h) Connect the monitor/ LCD Projector using VGA /HDMI cable	a) Connect external hardware to the CPU b) Set up LCD projector c) Connect PC/Laptop to Projector
51	Group Project (24) Assemble and test a small 0 to 12V , 500mA DC Power supply using Multi tapped transformer and a Rotary switch with enclosure	a) Read the circuit diagram b) Identify & select the Electronic components c) Populate on General purpose PCB d) Test the circuit	a) Complete the project and Test it

		e) Assemble the circuit and fix it in an enclosure	

Note : Group Project is compulsory (Not to be given in the End Examination)

ENGINEERING PHYSICS LAB PRACTICE

Subject Title : Engineering Physics Lab Practice
Subject Code : EC -109 A (Common)
Periods per week : 03
Total periods per year : 45

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.	Simple pendulum	03
5.	Velocity of sound in air – (Resonance method)	03
6.	Focal length and Focal power of convex lens (Separate & Combination)	03
7.	Refractive index of solid using traveling microscope	03
8.	Surface tension of liquid using traveling microscope	03
9.	Coefficient of viscosity by capillary method	03
10.	Boyle's law verification	03
11.	Meter bridge	03
12.	Mapping of magnet lines of force	03
	Revision	06
	Test	03
	Total:	**45**

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
4.0 Determine the value of acceleration due to gravity using Simple Pendulum
5.0 Determine the velocity of sound in air at room temperature
6.0 Determine the Focal length and focal power of convex lenses using U-V method
7.0 Determine the refractive index of a solid using travelling microscope
8.0 Determine the surface tension of a liquid using travelling microscope
9.0 Determine the viscosity of a liquid using capillary method
10.0 Verify the Boyle's law employing a Quill tube
11.0 Determine the specific resistance of wire material using Meter Bridge
12.0 Practice the mapping of magnetic lines of force

Competencies and Key competencies to be achieved by the student

Name of the Experiment	Competencies	Key competencies
1. Hands on practice on Vernier Calipers	• Find the Least count • Fix the specimen in posit • 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	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate thickness of glass place 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	• 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 angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
4. Simple pendulum	• 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
5. Velocity of sound in air –Resonance method	• Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonanting lengths • Calculate velocity of	• Adjust the reservoir level • Find the first and second resonanting lengths • Calculate velocity of sound • Calculate velocity of

Name of the Experiment	Competencies	Key competencies
6. Focal length and Focal power of convex lens (Separate & Combination)	• Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex lenses	• Calculate the focal length and power of convex lens • Draw u-v and 1/u – 1/v graph
7. Refractive index of solid using traveling microscope	• 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
8. Surface tension of liquid using traveling microscope	• 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
9. Coefficient of viscosity by capillary method	• 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

Name of the Experiment	Competencies	Key competencies
10. Boyle's law verification	• 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
11. Meter bridge	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific	• Find the balancing length • Calculate unknown resistance • Calculate the specific resistance
12. Mapping of magnet lines of force	• 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

ENGINEERING CHEMISTRY LAB PRACTICE

Subject Title : Engineering Chemistry Lab Practice
Subject Code : EC-109 B (Common)
Periods per week : 03
Total periods per year : 45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Familiarization of methods for Volumetric analysis	03
2.	Preparation of Std Na_2CO_3 and making different diluted solution.	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
7.	Determination of acidity of water sample	03
8.	Determination of alkalinity of water sample	03
9.	Determination of total hardness of water using Std. EDTA	03
10.	Estimation of Chlorides present in water sample	03
11.	Estimation of Dissolved Oxygen (D.O) in water sample	03
12.	Determination of pH using pH meter	03
13.	Determination of conductivity of water and adjusting ionic strength to	03
14.	Determination of turbidity of water	03
15.	Estimation of total solids present in water sample	03
	Total:	**45**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practice volumetric measurements (using pipetts, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.
2.0 Practice making standard solutions with pre weighted salts and to make desired dilutions using appropriate techniques.
3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3 solution for estimation of HCl
4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH
5.0 Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of H_2SO_4

6.0 Conduct titrations adopting standard procedures and using Std. $KMnO_4$ solution for estimation of Mohr's Salt

7.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available)

8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water)

9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution

10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)

11.0 Conduct the test using titrometric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)

12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter

13.0 Conduct the test on given samples of water / solutions

a) To determine conductivity

b) To adjust the ionic strength of the sample to the desired value

14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU

15.0 Conduct titrations adopting standard procedures to determine the total solids present in given samples of water (One ground water and one surface / tap water)

Competencies and Key competencies to be achieved by the student

Name of the Experiment	Competencies	Key competencies
Familiarization of methods for Volumetric analysis	--	--
Preparation of Std Na_2CO_3 and making different diluted solution	▪ Weighting the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions	▪ Weighting the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions

Name of the Experiment	Competencies	Key competencies
Estimation of HCl solution using Std. Na_2CO_3 solution	▪ Cleaning the glassware and rinsing with appropriate solutions ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Filling the burette with titrant ▪ Fixing the burette to the stand ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations ▪ Calculating the results	▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations
Estimation of NaOH using Std. HCl solution		
Estimation of H_2SO_4 using Std. NaOH solution		
Estimation of Mohr's Salt using Std. $KMnO_4$		
Determination of acidity of water sample		
Determination of alkalinity of water sample		
Determination of total hardness of water using Std. EDTA solution		
Estimation of Chlorides present in water sample		
Estimation of Dissolved Oxygen (D.O) in water sample (By titration method)		
Estimation of Dissolved Oxygen (D.O) in water sample (By electrometric method)	▪ Familiarize with instrument ▪ Choose appropriate 'Mode' / 'Unit' ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately ▪ Follow Safety precautions	▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately
Determination of pH using pH meter		
Determination of conductivity of water and adjusting ionic strength to required level		
Determination of turbidity of water		

Name of the Experiment	Competencies	Key competencies
Estimation of total solids present in water sample	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate ▪ Drying the crucible in an oven	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate

COMPUTER FUNDEMENTALS LAB PRACTICE

Subject Title : Computer Fundamentals Laboratory Practice
Subject Code : EC-110 (Common)
Periods/Week : 03
Periods/Year : 90

List of Experiments:

S. No.	Major Topics	No. of sessions each of 3 periods duration	No. of Periods
I.	Computer hardware Basics	01	03
II.	Windows Operating System	02	06
III.	MS Word	09	27
IV.	MS Excel	09	27
V.	MS PowerPoint	09	27
	Total	30	90

Rationale: The knowledge of Computer usage has become a must for everyone, due to widespread computer usage and related applications in all fields. This laboratory is designed to give the students hands on practice of Windows Operating System and MS Office to enable the students to use these skills in future courses.

I. Computer Hardware Basics (Not for end examination)

1. a).To Familiarize with Computer system and hardware connections
   b).To start and Shut down Computer correctly
   c). To check the software details of the computer
2. To check the hardware present in your computer

II. Windows's operating system (Not for end examination)

3. To Explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word
   Home - Insert - Page layout – References – Review - View
7. To practice Word Processing Basics
8. To practice Formatting techniques

9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV. Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout
14. To access and Enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To practice Excel Graphs and Charts
20. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

21. To familiarize with Ribbon layout features of PowerPoint 2007.
22. To create a simple PowerPoint Presentation
23. To set up a Master Slide in PowerPoint
24. To insert Text and Objects
25. To insert a Flow Charts
26. To insert a Table
27. To insert a Charts/Graphs
28. To insert video and audio
29. To practice Animating text and objects
30. To Review presentation

Competencies and Key Competencies to be achieved by the students

Exp No.	Name of the Experiment	Competencies	Key Competencies
1 (a).	To familiarize with Computer system and hardware connections	a. Identify the Parts of a Computer system a). CPU b) Monitor c) CD/DVD Drive d) Power Switch e) Start Button f) Reset Button b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU and connect Keyboard & Mouse	Connect cables to external hardware and operate the computer
1 (b).	To Start and Shut down Computer correctly	a. Log in using the password b. Start and shut down the computer c. Use Mouse and Key Board	a. Login and logout as per the standard procedure b. Operate mouse &Key Board
1 (c).	To Explore Windows Desktop	a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support	a. Access application programs using Start menu b. Use taskbar and Task manager
2.	To check the software details of the computer	a. Find the details of Operating System being used b. Find the details of Service Pack installed	Access the properties of computer and find the details
3.	To check the hardware present in your computer	a. Find the CPU name and clock speed b. Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board d. Use My Computer to check the details of Hard drives and partitions e. Use the Taskbar	a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required
4.	Working with Files and Folders	a. Create folders and organizing files in different folders b. Use copy / paste move commands to organize files and folders	a. Create files and folders Rename , arrange and search for the required folder/file

Exp No.	Name of the Experiment	Competencies	Key Competencies
	Working with Files and Folders Continued....	c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut to files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin	b. Restore deleted files from Recycle bin
5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	a. Familiarize with the use of Calculator b. Access Calculator using Run command c. Create Text Files using Notepad and WordPad and observe the difference in file size d. Use MS paint and create .jpeg, .bmp files using MS Paint	a. Use windows accessories and select correct text editor based on the situation. b. Use MS pain to create /Edit pictures and save in the required format.
6.	To familiarize with Ribbon layout of MS word. – Home – Insert- page layout- References-Review-View	a. Create/Open a document b. Use Save and Save as features c. Work on two documents simultaneously d. Choose correct Paper size and Printing options	a. Create a Document and name appropriately and save b. Set paper size and print options
7.	To practice Word Processing Basics	a. Typing text b. Keyboard usage c. Use mouse (Left click / Right click / Scroll) d. Use Keyboard shortcuts e. Use Find and Replace features in MS- word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar	a. Use key board and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections.
8.	To practice Formatting techniques	a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. The Styles of Word f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer	a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers to create lists c. Use Templates /Themes d. Insert page numbers date, headers and footers

Exp No.	Name of the Experiment	Competencies	Key Competencies
9.	To insert a table of required number of rows and columns	a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table – marking borders. Merging and splitting of cells in a Table b. Changing the background colour of the table c. Use table design tools d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order	a. Insert table in the word document and edit b. Use sort option for arranging data.
10.	To Insert objects, clipart and Hyperlinks	a. Create a 2-page document. &Insert hyperlinks and t Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table.	a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts
11.	To Use Mail merge feature of MS Word	a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes.	Use Mail merge feature
12.	To use Equations and symbols features.	a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS-EXCEL	a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- b. Use Quick Access Toolbar- Title Bar- Ribbon-Worksheets-Formula Bar-Status Bar	a. Familiarize with excel layout and use b. Use various features available in toolbar
14.	To access and Enter data in the cells	a. Move Around a Worksheets-Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel	a. Access and select the required cells by various addressing methods b. Enter data and edit

Exp No.	Name of the Experiment	Competencies	Key Competencies
15.	To edit spread sheet Copy, Cut, Paste, and selecting cells	a. Insert and Delete Columns and Rows-Create Borders-Merge and Center b. Add Background Color-Change the Font, Font Size, and Font Color c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width	Format the excel sheet
16.	To use built in functions and Formatting Data	a. Sort and filter data in a worksheet b. Perform Mathematical Calculations verify -AutoSum c. Perform Automatic Calculations-Align Cell Entries	Use built in functions in Excel
17.	To enter a Formula for automatic calculations	a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help	Enter formula for automatic calculations
18.	To Create Excel Functions, Filling Cells	a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically	a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations
19.	To Practice Excel Graphs and Charts	a. Produce an Excel Pie Chart b. Produce c. Excel Column Chart	a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph b. Produce a Pictograph in Excel
20.	To format a Worksheet in Excel, page setup and print	a. Shade alternate rows of data b. Add currency and percent symbols c. Change height of a row and width of a column d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print	a. Format Excel sheet b. Insert headers &footers and print
21.	To familiarize with Ribbon layout &features of PowerPoint 2007.	Use various options in Home, insert , design, animation , slideshow, Review &View in the PowerPoint	Access required options in the tool bar

Exp No.	Name of the Experiment	Competencies	Key Competencies
22.	To create a simple PowerPoint Presentation	a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide	a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes b. Use bullets option
23.	To Set up a Master Slide in PowerPoint and add notes	a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint f. Add Notes to a PowerPoint Presentation	a. Setup Masterslide and format b. Add notes
24.	To Insert Text and Objects	a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and word art f. Use 3d features g. Arrange objects	Inset Text and Objects Use 3d features
25.	To insert a Flow Chart / Organizational Charts	a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art	Create organizational charts and flow charts using smart art
26.	To insert a Table	a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend	Insert tables and format
27.	To insert a Charts/Graphs	a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart e. Format a Chart Background	Create charts and Bar graphs, Pie Charts and format.

Exp No.	Name of the Experiment	Competencies	Key Competencies
28.	To Insert audio &video, Hyper links in a slide Add narration to the slide	a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks	a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files
29.	To Practice Animation effects	a. Apply transitions to slides b. To explore and practice special animation effects like *Entrance, Emphasis, Motion Paths &Exit*	Add animation effects
30.	Reviewing presentation	a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation (a) Slides (b) Handout	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show

III SEMESTER

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERINGSCHEME OF INSTRUCTIONS AND EXAMINATIONS
III Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / Sem	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
EC- 301	Mathematics - II	4	-	60	3	20	80	100
EC -302	Electronic Devices & Circuits	4	-	60	3	20	80	100
EC -303	Electronic Measuring Instruments	4	-	60	3	20	80	100
EC-304	Analogue communication	4	-	60	3	20	80	100
EC-305	Digital Electronics	4	-	60	3	20	80	100
EC-306	Electrical Technology	4	_	60	3	20	80	100
PRACTICAL:								
EC-307	EDC lab	-	6	90	3	40	60	100
EC-308	Analogue Communication Lab	-	3	45	3	40	60	100
EC-309	Digital Electronics & CAD tools lab	-	6	90	3	40	60	100
EC-310	Electrical Technolgy Lab	-	3	45	3	40	60	100
TOTAL		24	18	630		280	720	1000

ENGINEERING MATHEMATICS – II

Subject Title : Engineering Mathematics-II
Subject Code : M-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 subject the student shall be able to :

Unit-I

1.0 Use Indefinite Integration to solve engineering problems

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

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

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

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

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

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

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

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

1.5 Find the Integrals of $\tan x$, $\cot x$, $\sec x$ and $\operatorname{cosec} x$ using the above.

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

1.7 Evaluate integrals of powers of $\tan x$ and $\sec x$.

1.8 Evaluate the Standard Integrals of the functions of the type

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

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

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

1.9 Evaluate the integrals of the type

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

1.10 Evaluate integrals using decomposition method.

1.11 Evaluate integrals using integration by parts with examples.

1.12 State the Bernoulli's rule for evaluating the integrals of the form $\int u.vdx$.

1.13 Evaluate the integrals of the form $\int e^x [f(x) + f'(x)]\, dx$.

Unit-II

2.0 Understand definite integral and use it in engineering applications

2.1 State the fundamental theorem of integral calculus

2.2 Explain the concept of definite integral.

2.3 Calculate the definite integral over an interval.

2.4 State various properties of definite integrals.

2.5 Evaluate simple problems on definite integrals using the above properties.

2.6 Explain definite integral as a limit of sum by considering an area.

2.7 Find the areas under plane curves and area enclosed between two curves using integration.

2.8 Obtain the volumes of solids of revolution.

2.9 Obtain the mean value and root mean square value of the functions in any given interval.

2.10 Explain the Trapezoidal rule, Simpson's 1/3 rules for approximation of integrals and provide some examples.

Unit -III

3.0 Solve Differential Equations in engineering problems.

3.1 Define a Differential equation, its order, degree

3.2 Form a differential equation by eliminating arbitrary constants.

3.3 Solve the first order first degree differential equations by the following methods:

i. Variables Separable.

ii. Homogeneous Equations.

iii. Exact Differential Equations

iv. Linear differential equation of the form $dy/dx + Py = Q$,

where P and Q are functions of x or constants.

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 : 04
Periods/Semester : 60

Rationale: Electronic devices and circuits is a core subject since Semi Conductor 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 also. 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	Transistors & Field Effect Transistors	10	13	1	1
2	Biasing and Small signal Model of BJT and FET.	16	29	3	2
3	Feedback Amplifiers , Power Amplifiers, Oscillators	20	29	3	2
4	Special Semiconductor Devices	10	26	2	2
5	Practical Applications	8	13	1	1
	TOTAL	60	110	10	8

11.0 Understand the working principle of BJT and FET

11.1 Explain the formation of transistor
11.2 Draw the symbol of transistor.
11.3 Explain the working of PNP and NPN Transistors.
11.4 Give reasons for popularity of NPN Transistor
11.5 Describe working of transistor as an amplifier (CB configuration)
11.6 Draw the different transistor configurations.
11.7 Explain cut off, saturation and active regions of transistor
11.8 Draw the input/output characteristics of CB, CC and CE configurations.
11.9 Define alpha, beta and gamma Factors.
11.10 Relate alpha, beta and gamma Factors.
11.11 Write collector current expression in CB and CE modes of transistors in terms of α, β, γ, IB, IC and ICBO, ICEO
11.12 Compare the performance characteristics of CB, CE and CC configurations
11.13 Explain the use of Each configuration a) CB configuration for impedance matching b)CE configuration for amplification and switching c) CC configuration for low output impedance, boot strapping and as current source
11.14 Give important specifications of Transistor
11.15 List 6 important applications of Transistor
11.16 Classify different types of JFETs
11.17 Describe the construction and principle of operation of n channel JFET.
11.18 Draw and explain the drain characteristics of JFET.
11.19 Draw and explain the mutual characteristics of JFET.
11.20 Define the parameters of JFET and obtain the relation among them.
11.21 List the advantages of JFET over BJT.

12.0 Understand transistor biasing and working of small signal amplifiers

12.1 Explain the basic amplifier concept using BJT–CE mode.
12.2 Explain the reasons for wide use of CE amplifier.
12.3 Explain the concept of DC and AC load lines.
12.4 Explain the selection of operating point on the DC load line with wave forms.
12.5 List the factors effecting the Q point
12.6 Explain thermal runaway
12.7 Explain the need for proper biasing in amplifier circuits and List the types of biasing circuits.
12.8 Explain the need for stabilization.
12.9 Define stability factor and derive an expression for stability factor of CE configuration.
12.10 Explain collector to base resistor method of biasing and explain its advantages and disadvantages.
12.11 Explain potential divider method of biasing and explain its advantages.
12.12 Draw the practical transistor CE amplifier and explain the function of each component(such as Cin,Cc,Ce,R1,R2 and Re)
12.13 Define h parameters of a transistor
12.14 Classify the amplifiers based on frequency(AF,RF), period of conduction(Class A,AB, B, C), and coupling(DC,RC,TC).
12.15 Need for Multistage amplifier (Cascading of amplifiers).
12.16 Define gain, frequency response and bandwidth of an amplifier.
12.17 Explain the principle of operation of two-stage RC coupled amplifier with circuit diagram.
12.18 Draw and explain the frequency response of RC coupled amplifier.

12.19 Explain the principle of operation of two-stage transformer coupled amplifier with circuit diagram.
12.20 Draw and explain the frequency response of transformer-coupled amplifier.
12.21 Explain the working of direct coupled amplifier with circuit diagram.
12.22 Explain the operation of Darlington pair with the help of circuit diagram.
12.23 Give the formula for the current gain
12.24 List 3 applications of Darlington pair
12.25 Draw and explain the frequency response of tuned amplifier(single, double tuned)
12.26 Compare different types of couplings.
12.27 Draw and explain the circuit of common source FET amplifier.

13.0 Understand working of Feedback amplifiers, Power Amplifier and oscillators

Feedback amplifiers

13.1 Explain the concept of feedback
13.2 Explain the Positive and Negative Feedback .
13.3 Compare Negative and Positive feedback.
13.4 Draw the block diagram of negative feedback amplifier and explain
13.5 List the 4 types of negative feedback amplifiers
13.6 Draw the block diagrams of voltage series ,current series, current shunt and voltage Shunt feedback amplifiers
13.7 Derive the expression for the gain of negative feedback amplifiers
13.8 Explain the effect of negative feedback on gain, bandwidth, input and output impedances.
13.9 List important merits of negative feedback amplifiers.

Large signal Amplifiers

13.10 Explain the need for Power Amplifier
13.11 Compare Voltage amplifier and Power amplifier
13.12 List 3 performance measures of power amplifier
13.13 Classify power amplifiers based on conduction (Class A, B, AB, C and D)
13.14 Explain the operation of Class A, Class B, Class AB & Class c with waveforms.
13.15 Draw the block diagram of power amplifier showing various stages
13.16 Explain the working of Transistor Push-pull amplifier circuit.
13.17 Explain the effect of distortion in amplifiers
13.18 List 6 distortions in power amplifiers
13.19 Explain Amplitude distortion and Cross over distortion in amplifiers.
13.20 Explain the choice of Class A , Class B Class AB Amplifier and Class C Amplifiers.
13.21 Mention the applications of Class C Amplifiers as Harmonic Generator and Frequency multiplier
13.22 Compare Efficiency of different types of amplifiers(A,B,C,D)

Oscillators

13.23 State the condition for an amplifier to work as an oscillator.
13.24 State the requisites of an Oscillator
13.25 Explain the Barkhausen criteria in oscillators.
13.26 Classify oscillator circuits.
13.27 Draw and Explain the working of an RC phase shift oscillator
13.28 Draw and Explain the working of tuned collector oscillator
13.29 Draw and explain the working of Hartley oscillator.
13.30 Draw and Explain the working of Colpitts oscillator

13.31 Write the expressions for frequency of oscillation and condition for sustained oscillations of the above circuits
13.32 State the reasons for instability in oscillator circuits.
13.33 Suggest the remedies for instability in oscillator.
13.34 List the advantages of crystal oscillators over other types
13.35 Draw the equivalent circuit of crystal and explain.
13.36 Draw and explain the working of transistor crystal oscillator
13.37 Explain the merits and demerits of RC and LC oscillators.

14.0 Understand working of special semiconductor devices
14.1 Explain the construction and principle of operation of depletion type n channel MOSFET.
14.2 Explain the construction and principle of operation of enhancement type n channel MOSFET.
14.3 Compare JFET and MOSFET.
14.4 Explain the principle of operation of CMOSFET.
14.5 Explain the working principle of Varactor diode and draw its characteristics.
14.6 List the applications of varactor diode.
14.7 Explain the construction, operation and characteristics of photo diode.
14.8 Explain the construction, operation and characteristics of photo transistor.
14.9 List the applications of photo diode and photo transistor
14.10 Explain the principle of photovoltaic cell.
14.11 List 3 important specifications of photovoltaic cells.
14.12 List 3 applications of photovoltaic cells.
14.13 Explain the working of opto-coupler
14.14 Explain the construction, working principle and characteristics of LED
14.15 Explain the construction and working principle of LCD.
14.16 Explain the applications of LED and LCD in discrete displays, dot-matrix and seven segment displays.

15.0 Practical Applications(circuit diagrams and component values)
15.1 Explain the operation of transistor series voltage regulator.
15.2 Explain the disadvantages of series Voltage Regulator
15.3 Explain the working of a transistor as a switch in CE and CC configurations.
15.4 Draw a Transistor circuit to drive a relay
15.5 Give design rules
15.6 Draw a Twilight Switch circuit using LDR/Photo Diode , Transistor and Relay
15.7 Explain the operation of above circuit.
15.8 Draw the circuit of Mains operated lamp using Opto-Coupler and relay.
15.9 Explain the operation of above circuit
15.10 Explain the use of JFET as current source.
15.11 Explain the operation of Transistor Astable multivibrator circuit to generate square wave.

COURSE CONTENT:

1. Formation and properties of PNP and NPN Transistor, Transistor configurations, input and output characteristics. α, β, and γ factors. Comparison of CB, CE, and CC configurations. Transistor as an amplifier. Classification of FETS**,**N-channel JFET construction, Working principle, characteristics, applications, FET parameters, MOSFET – types, working principle.

2. Transistor biasing and small signal amplifiers Transistor CE amplifier, DC and A.C load lines, operating point, stabilization, stability factor, proper biasing, types of biasing-collector to base biasing, potential divider biasing, practical transistor CE amplifier, definition of h parameters of a transistor , Classification of amplifiers, need of multi stage amplifier, working and frequency response of two-stage RC coupled amplifier, transformer coupled amplifier, direct coupled amplifier, emitter follower, Darlington pair, Common Source Amplifier.

3. Feedback , Power amplifiers and Oscillators, Principle of negative and positive feedback. Feedback amplifiers, block diagram, types, expression for gain, effects on gain, bandwidth, input and output impedances, advantages, power amplifier - classification amplifier. Requisites of an oscillator. Classification of oscillators. RC phase shift oscillator, Colpitts oscillator

4. Opto Electronic Devices, Classification of optoelectronic devices, LDR- working principle, characteristics. LED &LCD–construction, working principle, characteristics, photo diode and phototransistor – working principle characteristics, applications. photovoltaic cell

5. Practical applications Transistor works as a switch, crystal oscillators, Transistor circuit driving a relay Twilight Switch using LDR/Photo Diode, Mains operated lamp using Opto coupler and relay JFET current source

REFERENCE BOOKS:

1. Electronic Devices and Circuits by .David A.Bell 4th edition PHI
2. Basic Electronic Principles by Malvino. TMH
3. Electronic Circuits by Bogart
4. Basic Electronic Principles by Malvino. TMH
5. Principles of Electronics by V.K. Mehta.
6. Basic Electronics by B.L. Theraja S Chand

ELECTRONIC MEASURING INSTRUMENTS

Subject Title : ELECTRONIC MEASURING INSTRUMENTS
Subject Code : EC-303
Periods/Week : 04
Periods/Semester : 60

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.

TIME SCHEDULE

Sl	Major Topics	No. of periods	Weightage of Marks	Short Answer Questions	Essay Questions
1	Analog instruments	12	32	2	2
2	Digital instruments	12	26	2	1 ½
3	Cathode Ray Oscilloscope	12	32	2	2
4	Signal generators	12	26	2	1 ½
5	Testing Instruments	12	20	2	1
	Total	**60**	**136**	**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 Analog instruments

1. 1 List the characteristics of ideal Voltmeter and ideal Ammeter.
1. 2 Explain the construction and principle of operation of PMMC instrument.
1. 3 Explain the principle of extending the range of DC ammeter
1. 4 Explain the principle of extending the range of DC voltmeter.
1. 5 Explain the principle and working rectifier type voltmeter and ammeter.
1. 6 Explain the construction and principle of series and shunt type ohmmeters.
1. 7 Explain the use of Megger for measuring the insulation resistance
1. 8 Explain loading effect with an example.
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 problem in FET Voltmeters
1. 12 Explain the working of differential voltmeters.
1. 13 Explain the use of high voltage probe and clamp on current probe.
1. 14 Explain the resistance measurement using Wheat Stone Bridge.
1. 15 Explain the inductance measurement using Maxwell's Bridge
1. 16 Explain the capacitance measurement using Schering Bridge

1. 17 List 4 important errors and prevention in bridge measurements

2.0 Understand working of Digital instruments

2.1 List the 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 voltmeters with block diagram.
2.4 List the 4 important specifications of digital voltmeters.
2.5 Explain the working of digital frequency meter with block diagram.
2.6 List the 4 important specifications of digital frequency meter.
2.7 Explain factors effecting the accuracy and Resolution of a frequency meter.
2.8 Explain the working of digital LCR meter with block diagram
2.9 List the 4 specifications of digital LCR meter.

3.0 Understand construction, working principle and use of CRO

3.1 Draw 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 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 e) 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 oscilloscopes.

4.0. Understand the construction, working principle of AF, RF signal generators and power meters

4. 1 Explain the working of AF Oscillator (sine & square) 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.
4. 6 List the specifications of RF signal generator.
4. 7 Mention the 2 important applications of RF signal generators
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 meters.

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 digital IC tester with block diagram.
5. 8 Explain the working of logic analyser with block diagram.
5. 9 Explain the basic working principle of spectrum analyser and mention its use.
5. 10 State the need for plotters and recorders.
5. 11 Explain the working of XY recorders.
5. 12 Explain the working of plotter.
5. 13 Explain the working of logic probe.

COURSE CONTENTS

1. **Analog instruments:**
   PMMC Instrument, extending the range of instruments, series and shunt type ohmmeter, Megger, FET input voltmeter, differential voltmeter, Wheatstone, Maxwell, Schering Bridge.

2. **Digital Instruments:**
   Digital voltmeter, Digital Multimeter. Digital frequency meter, Digital LCR Meter.

3. **Cathode Ray Oscilloscope:**
   Block diagram of general purpose CRO, study of different blocks (in detail) sweep circuits, triggered sweep circuit, controls, specifications, applications, single trace CRO, dual trace CRO, sampling CRO.

4. **Signal Generators & Power meters**
   AF oscillator, function generator, RF signal generator and specifications, AF and RF power meters.

5. **Test instruments:**
   Q meter, Distortion Factor Meter, Plotter and Recorders. digital IC tester, Logic analyser, spectrum analyser.

REFERENCE BOOKS

1. Electronic measurements by A K Sawhaney
2. Electronic Measurements & Instruments by William David Cooper PHI
3. Modern Electronic Equipment by Khandpur
4. Electrical, Electronic Measurements and Instruments by Sahney
5. Electronic Measuring Instruments Gupta TMH
6. Electronic instrumentation and measurements by David A Bell, PHI
7. Electronic Instrumentation by H S Khalsi, TMH

ANALOG COMMUNICATIONS

Subject Title : ANALOG COMMUNICATIONS

Subject Code : EC-304
Periods/Week : 04
Periods/Semester : 60

Rationale: Analog communications is another core subject which forms the basis for Analogue Communication Hence the understanding of Analogue 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 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	Introduction to Communication System & Noise	10	16	2	1
2	Analog modulation techniques	14	26	2	2
3	Transmitters & Receivers	12	26	2	2
4	Antennas	14	26	2	2
5	Wave propagation	10	16	2	1
Total		**60**	**110**	**10**	**8**

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

1.0 Understand 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 Describe internal and external Noise
1.16 Define signal to noise ratio, noise figure and noise temperature

2.0 Understand the principles of Analog Modulation Techniques
2.1 Derive the time-domain equation for an AM signal.
2.2 Define the modulation index of an AM signal.
2.3 Draw the frequency spectrum of an AM signal.
2.4 Describe the effects of over modulation.
2.5 Calculate the bandwidth of an AM signal.
2.6 Derive the relation between total power and carrier power in AM
2.7 Explain the need for DSBSC and SSB modulation
2.8 List the advantages and disadvantages of SSB
2.9 List applications of SSB.
2.10 Explain Vestigial side band transmission
2.11 Solve simple problems on power calculations.
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 Explain noise triangle in FM
2.17 Compare AM , FM and PM
2.18 Explain narrow band and wide band FM
2.19 Define pre-emphasis and de-emphasis
2.20 State the need for pre-emphasis and de-emphasis in FM

3.0 Understand transmitters and receivers.
3.1 List the requirements and specifications of transmitters.
3.2 Draw the block diagram for high level modulated transmitter and explain
3.3 Draw the low level modulated Transmitter and explain.
3.4 Distinguish between low level and high level modulation
3.5 Draw the block diagram of basic SSB transmitter and briefly explain.
3.6 Draw the block diagram of FM transmitter using PLL and explain its working.
3.7 Draw the block diagram of indirect FM transmitter and explain (Armstrong method).
3.8 Draw the block diagram of TRF receiver and explain.

3.9 State the limitations of TRF Receiver.
3.10 Explain the need for super heterodyning in radio receiver.
3.11 Explain the working of super heterodyne receiver with a block diagram.
3.12 Explain the choice of IF.
3.13 Define sensitivity, selectivity and fidelity, image rejection ratio
3.14 Explain the need for AVC (AGC).
3.15 Explain the process of demodulation in AM receivers.
3.16 Draw the block diagram of FM receiver and explain
3.17 Explain Foster-seely discriminator.

4.0 Understand the working Principle of antennas

4.1 Explain the principle of an antenna
4.2 Define radiation pattern
4.3 Define isotropic antenna and draw its radiation pattern
4.4 Explain an elementary doublet
4.5 Explain half wave dipole and give its radiation pattern
4.6 Define the terms power gain, directivity, beam width, radiation resistance and front to back ratio of an antenna..
4.7 Explain the terms antenna impedance and polarization.
4.8 Explain the concept of grounding.
4.9 State the need for folded dipole.
4.10 State the need of antenna array.
4.11 Explain the operation of broadside and end fire arrays.
4.12 Define resonant and non-resonant antennas
4.13 Explain the construction and working of Rhombic antenna.
4.14 Describe the working of Yagi-Uda antenna.
4.15 Explain turnstile antenna
4.16 State the need for binomial array
4.17 Explain the principle of parabolic reflector.
4.18 Explain different feed arrangements
4.19 Explain the working of Horn and Loop antennas
4.20 Explain the working of Helical and Log periodic antenna
4.21 List the applications of dish antenna

5.0 Understand the methods of wave propagation

5.1 Describe the properties of electromagnetic waves (Absorption, attenuation)
5.2 Define power density and electric field intensity
5.3 Calculate power density and electric field intensity for waves propagating in free space.
5.4 Define Decibel and Neper
5.5 Define polarization of EM waves
5.6 Explain vertical and horizontal polarization.
5.7 Know the characteristic impedance of free space.
5.8 Describe reflection, refraction, diffraction and interference of EM waves.
5.9 List 4 types of wave propagation methods
5.10 Explain ground wave propagation
5.11 Explain sky wave propagation
5.12 Explain different layers in ionosphere
5.13 Define the terms critical frequency, MUF, skip distance and virtual height in sky wave propagation.
5.14 Explain space wave propagation

5.15 Define the term line of sight
5.16 Give the expression for LOS
5.17 Define fading
5.18 Explain the methods of diversity to reduce fading effects
5.19 Explain duct propagation
5.20 Explain tropospheric scatter propagation.

COURSE CONTENTS

1. Introduction to communication system.

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

2. Analog modulation techniques.

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

3. Transmitters and Receivers.

Requirements and specifications of transmitters, low level modulated, high level modulated, SSB transmitter, FM transmitters. TRF receiver, super heterodyne receiver, selection of IF, AVC, sensitivity, selectivity, fidelity- IMRR, AM detector, FM receiver-FM detector.

4. Antennas

Isotropic antenna-elementary doublet-half wave dipole – radiation resistance-efficiency,-gain, directivity- beam width-front to back ratio-radiation pattern-polarisation-effect of ground on antennas-folded dipole-non resonant antennas-antenna arrays – broadside &end-fire arrays- binomial-Yagi-turnstile-parabolic reflectors-Loop antenna-log periodic-helical antenna-horn antenna

5. Wave Propagation

Electromagnetic waves-reflection- refraction-diffraction-ground wave propagation-ionosphere propagation- space wave propagation-LOS-duct propagation- tropospheric scatter-propagation

REFERENCE BOOKS

1. Electronic communications systems by Roy Blake, Thomson Delmar
2. Electronic Communication System by George Kennedy.
3. Communication Electronics Frenzel TMH

4. Electronic Communication Modulation and Transmiission 2nd Edition-Schoenbeck Publisher PHI
5. Communication Systems By Simon Haykin-John Wiley
6. Modern analog and digital communications by B.P.Lathi –Oxford university press
7. Radio communication by G.K.Mithal- khanna publishers
8. Radio engg by Terman- McGrawhill
9. Antennas and Wave propagation by K.D.Prasad- Sathya Prakasahan Publications

DIGITAL ELECTRONICS

Subject Title : DIGITAL ELECTRONICS
Subject Code : : 305
Periods/Week : 4
Periods/Semester : 60

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	16	2	1
2	Logic Families	15	29	3	2
3	Combinational Logic circuits	15	29	2	2
4	Sequential Logic Circuits	10	26	2	2
5	Registers and Semiconductor Memories	8	10	1	1
	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 and compare with Decimal system.
1.2 Convert a given decimal number into Binary, Octal, and Hexadecimal numbers and vice versa.
1.3 Convert a given binary number into octal and hexadecimal number system and vice versa.
1.4 Perform binary addition, subtraction, Multiplication and Division.
1.5 Write 1's complement and 2's complement numbers for a given binary number.
1.6 Perform subtraction of binary numbers in 2's complement method.
1.7 Explain the use of weighted and Un-weighted codes.
1.8 Write Binary equivalent number for a number in 8421, Excess-3 and Gray Code and vice-versa.
1.9 Explain the use of alphanumeric codes (ASCII & EBCDIC)
1.10 Explain the importance of parity Bit.
1.11 State different postulates in Boolean algebra.
1.12 Explain the basic logic gates AND, OR, NOT gates with truth table.
1.13 Explain the working of universal logic gates (NAND, NOR gates) using truth tables.
1.14 Explain the working of an exclusive – OR gate with truth table.

1.15 State and explain De-Morgan's theorems.
1.16 Realize AND, OR, NOT operations using NAND, NOR gates.
1.17 Apply De-Morgan's theorems related postulates to simplify Boolean expressions (up to three variables).
1.18 Explain standard representations for logical functions (SOP and POS form)
1.19 Write Boolean expressions from the given truth table.
1.20 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.
2.2 Explain the characteristics of digital ICs such as logic levels, propagation delay, Noise margin, Fan-in, Fan-out, and Power dissipation.
2.3 Draw and explain TTL NAND gate with open collector.
2.4 Draw and explain TTL NAND gate with Totem pole output.
2.5 Draw CMOS NAND gate circuit and explain its operation.
2.6 Compare the TTL, CMOS and ECL logic families.
2.7 Give IC numbers of two input Digital IC Logic gates.

3.0 Understand the working of combinational logic circuits

3.1 Give the concept of combinational logic circuits.
3.2 Draw the Half adder circuit and verify its functionality using truth table.
3.3 Realize a Half-adder using NAND gates only and NOR gates only.
3.4 Draw the full adder circuit and explain its operation with truth table.
3.5 Realize full-adder using two Half-adders and an OR – gate and write truth table
3.6 Draw and explain a 4 Bit parallel adder using full – adders.
3.7 Draw and Explain 2's compliment parallel adder/ subtractor circuit.
3.8 Explain the working of a serial adder with a Block diagram.
3.9 Compare the performance of serial and parallel adder.
3.10 Draw and explain the operation of 4 X 1 Multiplexers
3.11 Draw and explain the operation of 1 to 4 demultiplexer.
3.12 Draw and explain 3 X 8 decoder.
3.13 Draw and explain BCD to decimal decoder.
3.14 List any three applications of multiplexers and decoders.
3.15 Draw and explain Decimal to BCD encoder.
3.16 State the need for a tri-state buffer and list the four t types of tri-state buffers.
3.17 Draw and explain One bit digital comparator.

4.0 Understand the working of Sequential logic circuits

4.1 Give the idea of Sequential logic circuits.
4.2 Explain NAND and NOR latches with truth tables
4.3 State the necessity of clock and give the concept of level clocking and edge triggering,
4.4 Draw and explain clocked SR flip flop using NAND gates.
4.5 Explain the need for preset and clear inputs .
4.6 Construct level clocked JK flip flop using S-R flip-flop and explain with truth table
4.7 Analyze the race around condition.
4.8 Draw and explain master slave JK flip flop.
4.9 Explain the level clocked D and T flip flops with the help of truth table and circuit diagram.
4.10 Give the truth tables of edge triggered D and T flip flops and draw their symbols.
4.11 List any four applications of flip flops.
4.12 Define modulus of a counter

4.13 Draw and explain 4-bit asynchronous counter and also draw its timing diagram.
4.14 Draw and explain asynchronous decade counter.
4.15 Draw and explain 4-bit synchronous counter.
4.16 Distinguish between synchronous and asynchronous counters.
4.17 Draw and explain asynchronous 3 bit up-down counter.
4.18 List any 2 commonly used IC numbers of flip flops, registers and counters for each.

5.0 Understand working of Registers and memories

5.1 State the need for a Register and list the four types of registers.
5.2 Draw and explain the working of 4 bit shift left and shift right registers
5.3 Draw and explain the working of 4-bit bi-directional shift register.
5.4 Draw and explain parallel in parallel out shift register
5.5 Explain the working of Universal shift register (74194)
5.6 Explain the working of ring counter and list its applications
5.7 List the four common applications of shift registers.
5.8 State memory read operation, writes operation, access time, memory capacity, address lines and word length.
5.9 Classify various types of memories based on principle of operation, physical characteristics, accessing modes and fabrication technology..
5.10 Differentiate between ROM and RAM
5.11 Explain basic principle of working of diode ROM
5.12 Distinguish between EEPROM and UVPROM.
5.13 Explain the working of basic dynamic MOS RAM cell.
5.14 Compare static RAM and dynamic RAM
5.15 Explain the working principle of NVRAM
5.16 State the difference between Flash ROM and NV RAM

COURSE CONTENT

1 Basics of Digital Electronics

Binary, Octal. Hexadecimal number systems. Conversion from one number system to another number system. Binary codes, excess-3 and gray codes. Logic gates :AND, OR, NOT, NAND, NOR, Exclusive-OR. Logic symbols. Boolean algebra, Boolean expressions. Demorgan's Theorems. Implementation of logic expressions, SOP and POS forms, Karnaugh map application.

5. Logic families

Characteristics of digital circuits: logic levels, propagation delay, Noise margin, Fan-in, Fan-Out, power dissipation, TTL NAND gate: open collector, totem pole output, CMOS NAND gate, ECL OR/NOR gate , comparison of TTL,CMOS and ECL logic families.

2 Combinational logic circuits

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

3 Sequential logic circuits

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

4. Registers and Memories

Shift Registers- Types, shift left ,shift right, bidirectional, Parallel in parallel out ,universal shift registers, ring counter and its applications, Memories-terminology related to memories, RAM, ROM, EEPROM, UVEPROM, static RAM, dynamic RAM, Flash ROM, NVRAM,

REFERENCE BOOKS

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

ELECTRICAL TECHNOLOGY

Subject Title : ELECTRICAL TECHNOLOGY
Subject Code : EC-306
Periods/Week : 05
Periods/Semester : 60

Rationale: Electrical Machines subject is reintroduced in the iii semester as the Knowledge of electrical machines is essential for the student to survive in the industry and also understand subjects like Industrial electronics as per the suggestions of industrial experts. Emphasis is laid on Fundamental concepts.

TIME SCHEDULE

Sl	Major topics	No of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	AC Circuits	22	26	2	2
2	DC machines	15	26	2	2
3	Polyphase Circuits	6	13	1	1
4	Transformers	8	16	2	1
5	AC machines	9	16	2	1
	Total	**60**	**110**	**10**	**8**

After completing this unit the learner will be able to

1.0 Working Of AC Circuits

1.1 Recap RL and RC series circuits
1.2 Explain mathematical representation of vectors in a) Symbolic notation ,b) trigonometric c) exponential and polar forms
1.3 Solve simple problems using J notation
1.4 Explain series RLC circuits
1.5 Solve problems on Series RLC circuits
1.6 Explain resonance in RLC series circuit
1.7 Derive the formula for series resonance
1.8 State the conditions for series resonance
1.9 Draw the characteristic curves for series resonance.
1.10 Define bandwidth of a resonant circuit
1.11 Define lower cut off and upper cut off frequencies
1.12 Give formula for lower cut off and upper cut off frequencies

1.13 Solve simple problems on series Resonance.
1.14 Explain Parallel AC circuit containing RLC
1.15 List the 3 methods a) Vector or phasor method b) Admittance method c) Vector algebra method. for solving AC parallel circuits.
1.16 Solve problems using above 3 methods
1.17 Explain Resonance in parallel circuits
1.18 State the conditions required for parallel resonance
1.19 Derive Equation for resonant frequency.
1.20 Give graphical representation of parallel resonance.
1.21 Compare Series and parallel resonance
1.22 Solve problems on Resonance
1.23 Explain effect of Resistance on Bandwidth.

2.0 Understand the working of DC Machines

2.1. State Faraday's laws of electro - magnetic induction
2.2. Explain dynamically and statically induced E.M.F
2.3. State Lenz's law
2.4. State and Explain Fleming's right hand rule
2.5. State and explain the Fleming's left hand rule
2.6. Explain the principle of DC Generators.
2.7. Explain the constructional features of DC generator with a sketch.
2.8. Explain the function of commutator and brushes
2.9. List the two types of windings used in DC generators and state their use.
2.10. Classify DC generators based on the type of excitation and field winding connections
2.11. Write the emf equation of DC generator.
2.12. Explain the characteristics of DC shunt Generator
2.13. Explain the principle of DC Motor.
2.14. Explain the significance of back EMF
2.15. Derive voltage equation of DC motor and condition for maximum power.
2.16. Derive equation for armature torque of dc motor
2.17. Derive equation for speed of a) DC series motor b) DC shunt motor
2.18. Define speed regulation of DC motor
2.19. Explain torque-speed behaviour of DC motor
2.20. Explain DC motor characteristics a) DC series motor b)DC shunt motor
2.21. Compare DC series motor and DC shunt motor
2.22. Explain power stages in DC motor
2.23. Mention the Losses in a DC Motor
2.24. Explain speed control of DC motors and factors affecting the speed.
2.25. Explain speed control of DC shunt motor by armature, field control and armature resistance control
2.26. Solve simple problems related to DC motors
2.27. Explain the need for starter.
2.28. Explain with a circuit the working of a 3 point starter

2.29. Give 4 important specifications of a motor
2.30. Explain the choice of particular motor for a given application.

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
3.12 Give the relation between Line Voltages, Phase voltages and Line currents &Phase currents in Delta configuration
3.13 Solve simple problems in 3 phase circuits

4.0 Understand the working of Transformers

4.1 Explain the concept of self and mutual inductance
4.2 Derive the expressions for self and mutual inductances
4.3 Define co-efficient of coupling
4.4 Explain the total inductance with series connections with reference to direction of flux.
4.5 Explain the working principle of transformer
4.6 Give constructional details of a) Core type transformer b) Shell type transformer
4.7 Give reasons for using laminations in transformer core
4.8 Derive the emf equation of a transformer
4.9 Explain voltage transformation ratio
4.10 Explain the operation of transformer on NO load and write the equation for no load current
4.11 Explain the operation of transformer on LOAD with the help of vector diagram under leading lagging and unity power factor
4.12 Solve problems on the above
4.13 Explain the losses in a transformer
4.14 Explain open circuit and short circuit tests and their purpose.
4.15 Define efficiency and regulation of transformer
4.16 Solve problems on the above
4.17 Classify transformer based on power rating, construction and applications
4.18 Explain the construction and working of an auto transformer
4.19 Explain the three phase connections of transformer, star-star, star-delta, delta-delta, delta star

4.20 Explain the applications of a transformer a)potential transformer b) current transformer c) impedance matching transformer d) isolation transformer
4.21 List the important specifications of a transformer and explain

5.0 Understand the working of AC Machines

5.1 Classify ac motors based on the principle of operation type of current and structural features
5.2 Explain the principle of induction motors
5.3 Explain the production of rotating magnetic field
5.4 Explain the constructional features of squirrel cage motor
5.5 Define slip, synchronous speed of an induction motor and give the relation
5.6 Write the equation for the frequency of rotor current
5.7 Draw the torque speed characteristics and explain
5.8 Explain the principle of Alternator
5.9 Mention various parts of an alternator and explain
5.10 Give equation for induced emf in an alternator
5.11 Explain the principle of synchronous motor
5.12 Explain the effect of excitation
5.13 Give applications of synchronous motors
5.14 List important specifications of an ac motor and explain
5.15 List the various applications and choice of particular ac motor for a given application
5.16 Explain the working principle capacitor start single phase induction motor.
5.17 Explain the principle of universal motor
5.18 Explain the working principle and constructional features of Servo motors
5.19 Explain the choice of selecting a motor for a particular application
5.20 List 3 applications for each of above.

COURSE CONTENT

1.0 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,

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2.0 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

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 TRANSFORMERS

Principle of transformer- Core type transformer-Shell type transformer-Laminations-transformation ratio- transformer on NO load- vector diagram-unity power factor-losses in a transformer-open circuit and short circuit tests-efficiency and regulation of transformer -

auto transformer- three phase connections of transformer, star-star, star-delta, delta-delta, delta star- applications of a transformers

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

REFERENCE

1. Electrical Technology by B L Theraja,

Electronic Devices and Circuits Lab Practice

Subject title : Electronic Devices and Circuits Lab Practice
Subject code : EC-307
Periods per week : 6
Periods / Semester : 90

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**	18
II.	**Transistors & Field Effect transistors**	12
III.	**Transistor Amplifiers and Oscillators**	18
IV.	**Special Devices**	12
V	**Circuit simulation using Pspice or equivalent**	30
	Total	90

List of Experiments:

Semiconductor Diodes and Rectifiers

1.To draw the forward & reverse characteristics of Silicon diode and a)determine Knee voltage, b)identify Cutoff, and Linear regions
   a) To test the diode with DMM & Analog multimeter and identify the Terminals
   b) To Connect a 6V lamp in series with diode and observe the behaviour i) under forward and reverse biased conditions. ii) On low voltage AC supply
   c) To observe the effect of temperature on diode reverse current by heating the diode with a soldering Iron

2. To draw the forward & reverse characteristics of Zener diode and determine Breakdown Voltage
   a) To test the Zener diode with DMM & Analog 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

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

5. To 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 Regulator ii) Implement a Dual regulated power supply using both +ve ad –ve 3 terminal regulators

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

II. Transistors & Field Effect transistors

7. To draw Input and output characteristics of NPN Transistor and determine Beta of the transistor
   a) To plot Input & Output characteristics for CB configuration
   b) To plot Input & Output characteristics for CB configuration CE configuration
   b) To test the Transistor with DMM & Analog multimeter and identify the Terminals and Type of transistor and find the β
8.To use Transistor as a Switch
   a) To Turn on and turn off a relay using Transistor (BC148 as a switch.)
   b) To Connect a 6v lamp in series with BD139 and observe the effect of base current variation on lamp brightness .

9. To determine the effective current gain of a Darlington Pair
   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.

10. To Draw the input and output characteristics of JFET and determine pinchoff voltage and transconductance.
   a) To test the JFET with DMM &Analog multimeter and identify the Terminals
11. To use JFET as a current source
   a) To Implement a constant current source with a FET by applying appropriate gate bias
   b) To practically Verify High input impedance characteristic of the gate circuit.

12. To Plot the frequency response characteristics of a RC coupled Amplifier.
   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 Resistance using CRO.
c) To Measure the output power using ac power meter

13. To 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. To implement transistor Astable multivibrator circuit and observe the waveforms on CRO.

IV. Special Semiconductor Devices

15. To plot the characteristics of a) Photodiode b) photo transistor
16. To Implement a Twilight switch using a Phototransistor and a Relay
    a) Replace Phototransistor with LDR and Test
17. To Plot the VI characteristics of different color LEDs & determine the Vf (forward voltage drop)
    a)To test the above devices with DMM & Analog multimeter and identify the Terminals
18. To plot the characteristics of a) LDR b) Thermistor c) VDR
    a) To test the above devices with DMM & Analog multimeter
    b) To implement a simple Temperature controller using Thermistor and a Relay
    c) To use a VDR /Trigistor for protection against high voltage surges and verify
19. To plot the characteristics of optocoupler MCT2E
    a) To test the given optocoupler and identify its terminals
    b) 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
20. To implement a simple timer using 1 M Ω Resistor , 1000 mfd capacitor ,Transistor BC148 and a Relay

Part 2: Circuit Simulation using pspice

1) Familiarize with the PSPICE modelling using eCAD software
- Representation of passive elements
- Representation of active elements
- Representation of time Vary signals
- Representation of nodes

2) To simulate half wave and full wave rectifier circuits with filters and assess the performance
3) To simulate 12v Zener regulator circuit and assess the performance for various loads
4) To Simulate of CE amplifier and observe the effect of disconnecting bypass capacitor.
5) To simulate Single stage RC coupled Amplifier circuit and observe the effect of change in component values on output waveform
6) To simulate JFET Common Source Amplifier circuit & observe the effect of change in gate bias.
7) To simulate Colpitts oscillator circuit and observe the effect of change in component values.
8) To simulate Hartley oscillator circuit and observe the effect of change in component values.
9) To simulate transistor Astable multivibrator circuit and observe the effect of change in component values.
10) Design a PCB for the RC coupled amplifier circuit with built in power supply.

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 & Analog 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 & Analog Multimeter
2	To draw the forward & reverse characteristics of Zener diode and determine Breakdown Voltage (3) a) To test the Zener diode with DMM & Analog 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 bservation and with DMM & Analog 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 ➢ 2.Read the circuit Diagram ➢ Identify Diode terminals ➢ select meters and equipment ➢ Observe the polarity of capacitors. ➢ 6. 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 b) To plot Input & Output characteristics for CB configuration CE configuration b) To test the Transistor with DMM & Analog multimeter and identify the Terminals and	➢Identify Transistor type & terminals with DMM ➢Select meters and equipment ➢Rig up the circuit ➢Measure Voltage and current. ➢Note the package &differences between BC148A, 148B, 148C and BF194 from the data sheets.	➢ ➢Identify Transistor type& terminals with DMM ➢Select meters and equipment ➢Rig up the circuit ➢Measure Voltage and current.

	Type of transistor and find the β		
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 &Analog 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	➢Rig up the circuit &Test ➢Measure voltage & current

		rating from data sheets	
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 Resistance using CRO. c) To Measure the output power using ac power meter	➢1.Identify the coupling and bypass capacitors and noting their values ➢2.Measure the amplitude and frequency on CRO ➢3.Observe the 3db points ➢4.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) ➢3 Observe the distortion(clipping) of signal on CRO and adjusting the input for distortion less output ➢
13	To 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. (3)	➢1.Identify Tuned circuit ➢2.Identify the active component and amplifier circuit . ➢3.Identify feed back circuit 4.Observe the waveforms on CRO. V. Vary the core of inductor & observe the effect on o/p frequency Identify the crystal in the circuit & note the component number	➢1.Identify different sections in the Oscillator circuit 2.Identify the Type of oscillator ➢3.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. ➢Test the devices with

		5.Assemble the circuit ➢6.Measure Voltage &Current ➢7.Note the specifications	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 & Analog 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 & Analog 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 sheets	➢Test the devices with DMM(Resistance Test) ➢Rig up the circuit ➢Measure Voltage & Current
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
➢PARTB			

1	Familiarize with the PSPICE modelling using eCAD software A. Representation of passive elements B. Representation of active elements C. Representation of time Vary signals D. Representation of nodes	➢Use pspice interface ➢Define circuit parameters ➢Model the circuit ➢Simulate the circuit ➢Observe and interpret results ➢Saving the files	➢1.Use Pspice/or eCAD for circuit simulation and debugging ➢2.Set circuit parameters
2	To simulate half wave and full wave rectifier circuits with filters and assess the performance	➢Define circuit parameters ➢Model the circuit ➢Simulate the circuit ➢Observe and interpret results ➢Save the files	➢1.Use Pspice/or eCAD for circuit simulation and debugging ➢2.Setcircuit parameters
3	To simulate 12v Zener regulator circuit and assess the performance for various loads.	➢Define circuit parameters ➢Model the circuit ➢Simulate the circuit ➢Observe and interpret results ➢Save the files	➢1.Use Pspice/or eCAD for circuit simulation and debugging ➢2.Setcircuit parameters
4	To Simulate of CE amplifier and observe the effect of disconnecting bypass capacitor.	➢Define circuit parameters ➢Model the circuit ➢Simulate the circuit ➢Observe and interpret results ➢Save the files ➢	➢1.Use Pspice/or eCAD for circuit simulation and debugging ➢2.Setcircuit parameters
5	To simulate Single stage RC coupled Amplifier circuit and observe the effect of change in component values on output waveform	➢Define circuit parameters ➢Model the circuit ➢Simulate the circuit ➢Observe and interpret results ➢Save the files ➢	➢Use Pspice/or eCAD for circuit simulation and debugging ➢Set circuit parameters
6	To simulate JFET Common source Amplifier circuit and observe the effect of change in gate bias.	➢Define circuit parameters ➢Model the circuit ➢Simulate the circuit ➢Observe and interpret results ➢Save the files ➢	Use Pspice/or eCAD for circuit simulation and debugging Setcircuit parameters
7	To simulate Colpitts oscillator circuit and observe the effect of change in component values.	➢Define circuit parameters ➢Model the circuit ➢Simulate the circuit ➢Observe and interpret results ➢Save the files ➢	1.Use Pspice/or eCAD for circuit simulation and debugging 2.Setcircuit parameters
8	To simulate Hartley oscillator circuit	➢Define circuit parameters	1.Use Pspice/or eCAD

	and observe the effect of change in component values.	➢Model the circuit ➢Simulate the circuit ➢Observe and interpret results ➢Save the files ➢	for circuit simulation and debugging 2.Setcircuit parameters
9	To simulate transistor Astable multivibrator circuit and observe the effect of change in component values.	➢Define circuit parameters ➢Model the circuit ➢Simulate the circuit ➢Observe and interpret results ➢Save the files ➢	1.Use Pspice/or eCAD for circuit simulation and debugging 2.Setcircuit parameters
10	Design a PCB for the RC coupled amplifier circuit with built in power supply	➢Define circuit parameters ➢Model the circuit ➢Simulate the circuit ➢Observe and interpret results ➢Save the files ➢	1.Use Pspice/or eCAD for circuit simulation and debugging 2.Setcircuit parameters

ANALOG COMMUNICATION LAB PRACTICE

Subject Title	:	Analog Communication Lab Practice
Subject Code	**:**	**EC-308**
Periods/Week	**:**	**03**
Periods/Semester	**:**	**45**

Rationale:

Analog communication lab is included to comprehend the concepts of analog 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) To Verify Thevenin's theorem.
b) To Determine the Thevenin's Resistance of a Potential divider network

c) To Verify Norton's theorem

2. a) To Verify Super position theorem.
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

II. Electronic measuring equipment

3. To measure the component values using special equipment

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.

III. Measurements using CRO

4. To familiarize with CRO front panel controls and observe the effect of different settings

a) To set intensity , Astigmatism and Focus controls to display i) Medium frequency ii) Low 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.

5. To determine Vertical and Horizontal deflection sensitivity of CRO by applying standard signal provided on CRO

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.

6. To use dual mode for simultaneous observation of two signals .

a) To use ADD mode observe the resultant wave form

b)To measure the Time period and frequency of a signal in Time base multiplier mode

7. a) To work with various controls on Digital CRO

b) To practice with i) Manual measurements ii) Cursor measurements iii) Automatic measurements By repeating sub experiments in experiment number 4& 5 .

c) To 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)To implement and observe AM signal and determine Modulation index using CRO

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

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. To generate FM signal and determine Modulation index
a)To Demodulate F.M signal and compare the output signal with original modulating signal .

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IV. Pulse and wave shaping circuits

11. a)To Measure the Rise time, Fall time , duty cycle, Pulse width, Pulse amplitude , Overshoot of Pulse on CRO
b)To observe the effect of Offset control on function generator on output waveform

12. a) To Design and implement RC integrator circuit
b) To apply a square wave and observe the output waveform on CRO.
c) To use a differentiator circuit to convert a long Push button trigger signal into a pulse for use in Timer circuits
d) To Use integrator circuit for producing triangular wave / Ramp
e) To Design a Low pass filter Using Integrator circuit for a given cut off frequency
f) To Design a High pass filter Using Differentiator circuit for a given cut off frequency

13. To Realize Clipper and Clamper circuits and observe the waveforms on CRO
a) To Realize Series and Parallel clippers
b) To Assemble Positive and negative clipper circuits with and without bias
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

V. Resonance &Filters

14. To 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

Objectives & 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	1.Assemble the circuit 2.Observe the polarity of sources and meters 3.Use voltmeter and ammeter correctly 4.Choose correct Ranges 5.Follow the sequence of procedure 6.Verify theoretical & Practical results 7.Troubleshoot any faults	1. Select meters and components Open and short the Circuit terminals with care 2.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	1.Assemble the circuit 2.Observe the polarity of sources and meters 3.Use voltmeter and ammeter correctly 4.Choose correct Ranges 5.Troubleshoot any faults	1.Use voltmeter and ammeter correctly 2. Observe Polarity 3.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.	1.Identify the RLC bridge/Digital RLC meter and note the front panel controls. 2.Measure component values by selecting the proper mode and range 3.Use distortion factor meter for measure percentage of distortion 4.Use AF power meter 5.Use function Generator 6.Use AC voltmeter in dB scale	1.Identify RLC meters 2 Use the RLC meter and Distortion factor meter 3.Use AF power meter 4.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 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	1.Use Function Generator 2.Use various controls and select appropriate ranges on analog CRO 3.Connect BNC Probe 4.Test the BNC Cable before applying the signal 5.Observe Positive and Negative peaks of a wave form.	1.Use Function generator 2.Use CRO controls and selecting Correct Ranges 3.Produce flicker free waveform and measure the amplitude , Time period and frequency of signal

	on CRO.		
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.	**1.** Apply standard signal & calibrate **2.** Display the waveform from set point using Trigger control **3.** Determine Vertical and Horizontal deflection sensitivities and carryout accurate measurements 4.Measure the amplitude and frequencies of small and high level signals using CRO Probes	**1.** Apply standard signal & calibrate **2.** Display the waveform from set point using Trigger control **3.** 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 phase angle and compare frequencies using Lissajous patterns method	1.Select XY mode in CRO 2. Apply signals to correct channels 3..Measure phase angle by lissajous pattern method and interpret them 4.Compare frequencies by lissajous pattern method	1.Select XY Mode in CRO 2.Measure phase angles by Lissajous pattern method 3.Compare frequencies by 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	1.Use Controls on Digital CRO 2.Use different modes of measurement 3.Use storage function of Digital CRO to capture transient characteristics	1.Use Controls on Digital CRO 2.Use different modes of measurement 3.Use storage function of Digital CRO to capture transient characteristics

	RC circuit		
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	1.implement AM Circuit and Test 2.Identify maxima and minima on the displayed waveform 3.Overmodulate and under modulate the AM signal 4.Use CRO in XY mode to determine modulation index 5.Identify diode demodulator circuit components	1.perform the Experiment as per procedure and calculate modulation index. 2.Identify maxima and minima on the displayed waveform 3.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)	1.Note down the Radio frequency Bands by observe the Dial. 2.Identify the tuned circuits corresponding to different bands 3.Observe Band selection switch connections in AM receiver 4.Identify different sections in Radio receiver . 5.Measure the Voltages at Test points with multimeter	1.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)	1.Observe the FM signal on CRO 2.Measure the amplitude and frequencies of carrier and Modulating Signal 3.Measure the Frequency Deviation 4.Identify FM Detector circuit and note down the	1.Identify FM signal, on CRO 2. Measure the amplitude &Frequency of baseband & Carrier on CRO 3. Measure frequency deviation

		IC numbers 5.Identify the amplitude limiter section on FM detector	
11	To Measure the Rise time, Fall time , duty cycle, Pulse width, Pulse amplitude , Overshoot of Pulse on CRO(3) b)To observe the effect of Offset control on function generator on output waveform	1.Identify the Pulse waveform 2.Measure pulse parameters using CRO by selecting correct Timebase and Volts/Div	1.Identify the Pulse waveform 2.Measure pulse 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	1. Identify Passive Differentiator and integrator circuits. 2. Choose correct values for components 3. Vary the Time constant 4. Use the Differentiator and integrator circuits for wave shaping applications	**1.** Choose correct values for components **2.** Rig up the circuit **3.** 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 c) To Connect a Zener diode in	**1.** Choose correct values for components **2.** Rig up the circuit **3.** Observe & Measure Input/Output waveforms **4.** Vary the Time constant **5.** Use clipper and Power clamper circuits for protection	**1.** Rig up the circuit **2.** Observe & Measure Input/Output waveforms **3.** Vary the Time constant

	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		
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	1) To identify the TUNED circuit components 2) connect L and C to form a series and parallel resonant circuit 3)Identify the resonant frequency by observing waveform peak on CRO 4) Determine theoretical Resonant frequency	1. Identify tank circuit components 2.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	1.Identify the Filter circuit components 2.Design the Low pass & high pass Filter for a given cut off frequency 3.Observe and locate 3db points on the response curve	1.Design the Low pass & high pass Filter for a given cut off frequency

DIGITAL ELECTRONICS LAB PRACTICE& ECAD TOOLS LAB PRACTICE

Subject Title	**:**	**Digital Electronics & eCAD Tools Lab Practice**
Subject Code	**:**	**EC-309**
Periods/Week	**:**	**06**
Periods/Semester	**:**	**90**

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
I.	**Basic Gates and Logic Families**	**12**
II.	**Realization of Boolean Functions using Gates**	**12**
III.	**Realization of Boolean Functions using Multiplexers and DeMultiplexers**	**12**
IV.	**Flip Flops & Timing Circuits**	**12**
V.	**Counters & Shift Registers**	**12**
VI	**Digital Circuit simulation using Pspice**	**30**
		90

LIST OF EXPERIMENTS

I. Basic Gates and Logic Families

1. To 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. To Verify the truth tables of AND, OR,NOT, NAND, NOR Gates
   a) To Measure threshold voltages resulting in change of a state of a NAND gate
   c) To Verify the truth table of 7403 IC (open collector quad 2input NAND gate).
   d) To 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

   b) Implement a 4bit complement generator using 7486 quad XOR IC
   c) Realize a simple comparator using XOR Gate
   d) Realize a NOT gate using XOR gate

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.

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

7. a)To 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 . To 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. To 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.To Verify the Truth table and Functions of De multiplexers (Using IC 74154)

11. To Verify the function of 4-bit magnitude comparator 7485IC.
   a) Verify the effect of giving different logic inputs to pins 2,3,4 of IC
   b) Realize a simple 2bit comparator using XOR Gate

IV. Flip Flops & Timing Circuits

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

a) Realize a Bistable element with two NOT gates and a Feedback Resistor
b) Implement a bounce Elimination switch using the above Gates
c) Realize a clock circuit using 4093 CMOS Nand Gate , Resistor and capacitor and observe the waveform on CRO

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

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

V . Counters and Shift Registers

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

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

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

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

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

18.To 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 (30 Periods)

1. Familiarization of usage of ORCAD suite of tools for the design and layout of printed circuit boards (PCBs).
2. Simulate a 4 bit full adder /subtractor and test.
3. Design and simulate code converters using logic gates

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

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

6. Design and Simulate 4 bit ripple counter with Mod-10 and Mod- 12
7. Produce PCB layouts for above circuits

Competencies and Key competencies to be achieved

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	1.Identify digital IC from the number printed 2.Give Pin out diagram 3.Identify +ve and -ve Power supply pins 4.Insert and remove the iC into and from the socket by observing starting (1) pin 5.Make switch connections	1.Identify digital IC from the number printed 2.Identify +ve and -ve Power supply pins 3.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 observations d) Verify the Truth table of 4073 IC	1.Write the truth table for any Logic gate 2.Apply correct Logic level Voltages 3.Find out IC details from the datasheets 4.Test the IC for its correct functionality by verifying the truth table 5.Test the IC by feeling the heat by touching	1.Apply correct Logic level Voltages 2.Test the IC for its correct functionality by verifying the truth table 3.Test the IC by feeling the heat by touching
3	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	1.Substitute 2 input NAND or NOR gates to obtain the functionality of any logic gate with any number of inputs 2.Use open collector logic gates with pull up resistor Read the data sheets	1.Substitute 2 input NAND or NOR gates to obtain the functionality of any logic gate with any number of inputs 2.Use open collector logic gates with pull up resistor
4	Implement XOR Logic using 2 input Nand Gates and NOR Gates and verify the truth table(3) b) Implement a 4bit complement generator using	1.Realize simple Boolean functions using NAND &NOR gates 2.Verify truth table by observing inputs and outputs	1.Verify truth table by observing inputs and outputs 2.Use XOR gate in simple logic circuits

	7486 quad XOR IC c) Realize a simple comparator using XOR Gate d) Realize a NOT gate using XOR gate	3.Use XOR gate in simple logic circuits	
5	a) 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.	1.Realize simple Boolean functions using karanaugh maps method 2.Applying correct logic voltages to CMOS ICs 3.Follow precautions 4.Read data sheets to check Fan-in and Fan-out capacity	1.Realize simple Boolean functions using karanaugh maps method 2.Applying correct logic voltages to CMOS ICs 3.Follow precautions
6	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	1.Realize simple Boolean functions using karanaugh maps method 2.Design Half adder/Full adder circuit 3.Use 7448 IC in the circuits	1.Design Half adder/Full adder circuit 2.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	1.Develop logic for Decoder Circuit 2.Use 74138 in digital circuits 3.Combine Decoder ICs to handle more bits	1.Use 74138 in digital circuits 2.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	1.Develop logic for Encoder Circuit 2.Use 74148 in digital circuits 3.Combine Decoder ICs to handle more bits	1.Use 74148 in digital circuits 2.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 c) Implement the given function using IC 74150 16:1 line multiplexer	1.Develop logic for Multiplexer 2.Use 74153 in digital circuits Combine Multiplexer r ICs to handle more bits 3.Use Multiplxer ICs to realize given function	1.Combine Multiplexer r ICs to handle more bits 2.Use Multiplxer ICs to realize given function
10	To Verify the Truth table and Functions of De multiplexers (	1.Develop logic for DeMultiplexer	1.Combine DeMultiplexer ICs Use

	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	2.Use 74154 in digital circuits Combine DeMultiplexer ICs 3.Use DeMultiplxer ICs to realize given function	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	1.Develop logic for magnitude comparator 2.Verify the function of Magnitude comparator 3.Use 7485IC in digital circuits	1.Verify the function of Magnitude comparator 2.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 Gate , Resistor and capacitor and observe the waveform on CRO b) Interpret the specifications of 4093 IC from data sheets	1.Develop logic for Latch circuits 2.Use Not gates for Latch circuit applications 3.Use latch circuits for de bouncing application 4.Use Schmitt trigger NAND gate for clock circuits	1.Use Not gates for Latch circuit applications 2.Use latch circuits for de bouncing application 3.Use Schmitt trigger NAND gate for clock circuits
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	1.Develop logic circuit for Clocked RS flip Flop using 7400 IC 2.Verify the truth tables of CD4013 and 74L71 IC 3.Use Preset and Clear Inputs 4.Verify the Truth table of 7476 IC 5.Modify 7476 to function as	1.Verify the truth tables of CD4013 and 74L71 IC 2.Use Preset and Clear Inputs 3.Verify the Truth table of 7476 IC 4.Modify 7476 to function as D flip Flop and T Flip Flop 5.Use octal latch

	octal latch 74LS373	D flip Flop and T Flip Flop 6.Use octal latch 74LS373	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	1.Develop logic for implementing Up/down counter 2. change the modulus of the counter 3.Connect Counter IC 7447 IC to display the count 4. Cascade Counter ICs	1. change the modulus of the counter 2.Connect Counter IC 7447 IC to display the count 3.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	1.Develop logic for implementing Up/down counter 2.change the modulus of the counter 3.Load the Preset inputs of CD4029	1.Change the modulus of the counter 2.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	1.Develop logic for implementing shift Registers 2.Verify the truth table of 7495Ic in all modes 3.Verify the truth table of 74194 Universal shift register in all modes	1.Verify the truth table of 7495Ic in all modes 2.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	1.Develop logic for implementing 2.Verify the truth table of Johnson counter 3.Set the modulus of counter to required value 4.Use 4017 in frequency divider circuits and other digital circuits	1.Set the modulus of counter to required value 2.Use 4017 in frequency divider circuits and other digital circuits
18.	To Identify Various Memory ICs and Note their pin Configuration	1.Distinguish memory chips	1.Find out the memory

	from the datasheets(3) a) RAM b) ROM c) EPROM d)EEPROM	from other Integrated circuits by observation and IC number 2.Find out the memory capacity from the IC number 3.Identify different memory chips	capacity from the IC number 2.Identify different memory chips
18	Familiarization of usage of ORCAD suite of tools for the design and layout of printed circuit boards (PCBs).(3)	1.Use ORCAD suite and its features Select Components , 2.Draw the circuit &simulate 3.Debug the errors	1.Select Components , 2.Draw the circuit & simulate 3.Debug the errors
19	Simulate a 4 bit full adder /subtractor and test.(3)	1.Develop logic for implementing 4 bit full adder /subtractor 2.Select Components , 3.Draw the circuit & simulate 4.Debug the errors	1.Select Components , 2.Draw the circuit & simulate 3.Debug the errors
20	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	1.Develop logic for implementing 4 bit full adder /subtractor 2.Select Components , 3.Draw the circuit & simulate 4.Debug the errors	1.Select Components , 2.Draw the circuit & simulate 3.Debug the errors
21	Design and simulate 16 bit odd/even parity checker /generator using IC74180 (3)	1.Develop logic for implementing 4 bit full adder /subtractor 2.Select Components , 3.Draw the circuit & simulate 4.Debug the errors	1.Select Components , 2.Draw the circuit & simulate 3.Debug the errors
22	Design and Simulate 4 bit ripple counter with Mod-10 and Mod- 12 (3)	1.Develop logic for implementing 4 bit full adder /subtractor 2.Select Components , 3.Draw the circuit & simulate 4.Debug the errors	1.Select Components , 2.Draw the circuit & simulate 3.Debug the errors
23	Produce PCB layouts for above circuits(3)	1.Develop logic for implementing 4 bit full adder /subtractor 2.Select Components , 3.Draw the circuit & simulate 4.Debug the errors	1.Select Components , 2.Draw the circuit & simulate 3.Debug the errors

24	Design a PCB for the DAC80 circuit(3)	1.Develop logic for implementing 4 bit full adder /subtractor 2.Select Components , 3.Draw the circuit & simulate 4.Debug the errors	1.Select Components , 2.Draw the circuit & simulate 3.Debug the errors
25	Design a PCB for the ADC80 A/D Converter circuit (3)	1.Develop logic for implementing 4 bit full adder /subtractor 2.Select Components , 3.Draw the circuit & simulate 4.Debug the errors	1.Select Components , 2.Draw the circuit & simulate 3.Debug the errors

ELECTRICAL TECHNOLOGY LAB PRACTICE

Subject Title	**:**	**Electrical technology Lab Practice**
Subject Code	**:**	**EC-310**
Periods/Week	**:**	**03**
Periods/Semester	**:**	**45**

Rationale: Electrical Technology lab is included to enable the student to supervise and handle electronically controlled electrical equipment with confidence when they join the industry. Sound knowledge in electrical engineering greatly helps the students in understanding the concepts in subjects like Industrial electronics. Emphasis is laid on basic electrical engineering skills.

S. No.	Major Topics	No. of Periods
I.	**Basic electrical equipment and Instruments**	**21**
II.	**DC Machines**	**12**
III.	**Transformers**	**6**
IV.	**AC Motors**	**6**
	Total	**45**

List Of Experiments

I. Basic electrical equipment and Instruments

1. To Identify Electrical Machines and Equipment, wires cables etc

2. To Identify & test Single phase Transformer b) Auto transformer c) single phase Induction motor d) 3 Phase induction motor e) DOL Starter f) Star Delta starter g) Loading Resistance h) Electric Lamp Load i) Water load Identify and test Electrical Instruments.

3. To Identify A)Moving coil Volt meters B) Moving coil Ammeters c) Moving Iron Voltmeters d) Moving Iron Ammeters e) Dynamo meter type watt meter .

4. To Convert and extend range of PMMC meters
   a) To extend the range of voltmeter using multiplier

   b) To observe the Loading effect of volt meter on high impedance circuit

c)To Open and identify the following parts a) Permanent magnet b) Coil c) Former d) Phosphor bronze springs e) Pointer, Multiplier/Shunt etc a) To convert an ammeter into Voltmeter

5. To extend the range of ammeter using a shunt Resistance
   a) To Measure current using voltmeter and standard Resistance.

6. To Measure the power consumed by a 100 watts incandescent lamp using Voltmeter and ammeter method a) On AC 230V b) DC 220V

7. To apply a Low voltage to an Incandescent lamp using auto Transformer and observe the effect of voltage on Light output (Measure the Voltage and current)

8. To Measure the power consumed by an Electric motor (Fan) and Lamp load separately using wattmeter , Voltmeter and Ammeter and Determine power factor

9. To Connect a 2500 ohm 1A Rheostat in series with a 100 W Lamp and observe the effect of Variation of Resistance on the input current and Light output
10. To Draw the OCC Characteristics of Shunt generator

11. To Control the speed of a DC shunt motor using a) Armature control method b) Field control method
    b) To reverse the direction of a DC shunt motor

12. To Plot the Load characteristics of DC shunt motor

13. To Start a DC Series motor Using a 2 point/4 point starter

14. To Determine the transformation ratio of a 1 phase transformer
    a) Apply rated Voltage to the secondary terminals of transformer using auto transformer and measure the Voltage across primary winding

15. To Perform OC and SC tests on transformer to determine Efficiency and Regulation at any given
16. To start a single phase AC motor with DOL Starter
17. To start a 3 phase AC motor with star delta starter and also reverse the direction of rotation
18. To Run the AC 1 Ø Servo motor in forward and reverse directions using SPDT Switch

Competencies and Key Competencies

Exp No	Experiment name (No Of periods)	Competencies	Key Competencies
1	Identify Electrical Machines and Equipment, wires cables etc. (1) a) Identify a) Electrical Control Panel a) SCR Power Rectifier unit b) DC shunt Generator , c) DC Shunt Motor d) DC Series Motor e) 3 point starter f) 4 point starter e) DC Motor Generator Sets	1)Identify the Control Panel and Correct Mains switch 2)Identify DC power Source 3) Identify DC machines by Their Size Shape and Name plate details d) Identify the DC Motor Starters by their construction.	1) switch on/Switch Off the correct mains switch in the panel corresponding to the experiment location. 2) Identify the correct Machine in the laboratory by Name 3) Identify the appropriate starter for the DC motor
2	Identify Single phase Transformer b) Auto transformer c) single phase Induction motor d) 3 Phase induction motor e) DOL Starter f) Star Delta starter g) Loading Resistance h) Electric Lamp Load i) Water load(1)	1)Identify the 1 phase transformer & Auto Transformer 2.Interpret the name plate details b)Identify AC motors and Interpret name plate details c) Identify AC motor starters d) Identify Different electrical loads and operate them	1) Guess the transformer/Auto transformer capacity by size and weight 2) Interpret Name plate details and Estimate the fuse wire rating .
3	1. Identify Electrical Instruments. (1)	1)Identify MC and MI Ammeters by observing the dial , Symbol , Polarity Marking 2) Identify the Range 3) Identify Wattmeter	1)Identify different types of meters and Use 2. Identify the Range 2) Select Correct meter with correct Range.
4	To work with PMMC meters (3) a) To convert an ammeter into Voltmeter b) To Extend the range of voltmeter using multiplier c) To extend the range of ammeter using a shunt Resistance e) To observe the Loading effect of volt meter on high impedance circuit	1) identify the PMMC meters by observing the linear scale. 2) Measure meter Resistance 3) Calculate Multiplier and shunt Resistor values 4) Measure current using voltmeter.	1) Identify PMMC meters 2) Extend the range of meters. 3)Identify the parts of PMMC meter

	f) To open and identify the following parts a) Permanent magnet b) Coil c) Former d) Phosphor bronze springs e) Pointer , Multiplier / Shunt etc		
5	To Measure the power consumed by a 100 watts incandescent lamp using Voltmeter and ammeter method a) On AC 230V b) DC 220V(3)	1) Select Correct meters and Ranges (Both AC and DC) for measure Voltage and Current 2) Substitute Lamp load for Resistive load 3) Verify power consumption for both AC and DC 4) reading the meter scale without parallax error	1) connect Voltmeter and ammeter in the circuit 2) Choose Correct meters and select correct Ranges
6	To Apply a Low voltage to an Incandescent lamp using auto Transformer and observe the effect of voltage on Light output (Measure the Voltage and current) (3)	1) Identify autotransformer terminals & Make connections 2.djust the Auto transformer to required Voltage	1) Use the Auto transformer and adjust to produce required Low/ High Voltage
7	To Measure the power consumed by an Electric motor (Fan) and Lamp load separately using wattmeter , Voltmeter and Ammeter and Determine power factor (3)	1) Connect Wattmeter for power measurement b) choose correct ranges , Type for wattmeter , Voltmeter and Ammeter 2) Verify the effect of Powerfactor	1.Use the Wattmeter to measure the power
8	To Connect a 2500 ohm 1A Rheostat in series with a 100 W Lamp and observe the effect of Variation of Resistance on the input current and Light output (3)	1).Familarize with the construction and operation of Rheostat , b) Set rheostat to minimum and Maximum positions c) Use the rheostat as a variable Resistance	1)Use the rheostat as variable Resistance 2) Setting rheostat to minimum , Maximum and to desired values of Resistance
9	To Connect the Rheostat as a potential divider and produce a variable voltage (3)	1)Familarize with the construction and operation of Rheostat , 2) Setting rheostat to minimum and Maximum positions 3) Using the rheostat as a Potentiometer d) understand the heating effect of Electric current	1)Use the rheostat as variable Resistance 2)Use the rheostat as potential divider
10	To Draw the OCC Characteristics of Shunt generator (3)	1)Interpret name plate details 2) Identify the Terminals on shunt generator with	1)Identify field and armature winding terminals.

		multimeter 3) Set the Rheostat to minimum and maximum Resistance positions 4) Identify the following parts 1)Yoke 2)Pole shoes 3. Field winding 4)Armature 5) Commutator 6)Brushes 7) Coupling 8) Bearin	2)Make connections
11	To Control the speed of a DC shunt motor using i) Armature control method ii) Field control method b) To reverse the direction of a DC shunt motor (3)	1) Interpret name plate details 2) Identify 3 Point starter 3) Set the Rheostat to minimum and maximum Resistance positions 4) Make connections as per circuit diagram 5)Measure the speed with tachometer 6) Interchange armature/ field connections	1)Make connections as per circuit diagram 2)Vary the speed with field Rheostat and armature Rheostat 3)Measure the speed with tachometer 4)Reverse the direction of motor
12	To Plot the Load characteristics of DC shunt motor (3)	1) Change the load on with Brake arrangements. 2) Choose appropriate wires (Gauge and Colours) and Correct meters. 3) Measure the speed with tachometer 4) Follow the precautions	1)Change the load on with Brake arrangements. 2).Measure the speed with tachometer 3).Follow the precautions
13	To Start a DC Series motor Using a 2 point/4 point starter (3)	1) Identify 2/4 point starter 2) Make connections as per circuit diagram 3) Reverse the motor direction 4) Follow precautions	1)Make connections as per circuit diagram 2)Reverse the motor direction 3)Follow precautions
14	To Determine the transformation ratio of a 1 phase transformer b) Apply rated Voltage to the secondary terminals of transformer using auto transformer and measure the Voltage across primary winding (3)	1) Interpret name plate details 2) Identify Primary and secondary windings i) by observation ii) by test with DMM 3) Making connections as per circuit diagram 4)Measure AC current and voltages 5) Performing experiment as per procedure 6) Interpret the results f)	1)Identify the transformer windings 2) Interpret name plate details and know the transformer rating 3) use transformer for Step down and Step up applications 4) Determine transformation Ratio

		Determine transformation Ratio 7) understand the step up and step down functions of transformer.	
15	To Perform OC and SC tests on transformer to determine Efficiency and Regulation at any given load and Power factor (3)	1) Interpret name plate details 2) Identify Primary and secondary windings 3). Using Autotransformer to apply desired voltage 4) Short circuit the secondary winding 5) Connecting Wattmeter, choosing correct range and finding Multiplication factor 6) Interpret the results and determining the copper loss 7)Calculate % Regulation , total losses , Efficiency at any given load	1)Make wattmeter connections 2)Determine transformer losses Practically
16	To start a single phase AC motor with DOL Starter (3)	1)Make connections to starter and start /Stop the Motor 2)Follow precautions	1)Make connections to starter and start /Stop the Motor
17	To start a 3 phase AC motor with star delta starter and also reverse the direction of rotation (3)	1)Make connections to starter and start /Stop the Motor 2)Follow precautions	1)Make connections to starter and start /Stop the Motor
18	To Run the AC 1 Ø Servo motor in forward and reverse directions using SPDT Switch (3)	1) Identify AC servomotor 2)To familiarize with the operation of AC servomotor 3) Interpret name plate details 4)Using SPDT switch for reversing the AC servomotor direction	1) Identify AC servomotor 2) Reversing the direction of rotation.

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING

SCHEME OF INSTRUCTIONS AND EXAMINATIONS

IV Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / Sem	**Scheme of Examination**			
		Theory	Practical /Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
EC - 401	Mathematics - III	4		60	3	20	80	100
EC - 402	Linear Integrated Circuits	5		75	3	20	80	100
EC - 403	Network Analysis	5		75	3	20	80	100
EC - 404	Digital Communications	4		60	3	20	80	100
EC - 405	Microprocessor & Microcontroller Programming	4		60	3	20	80	100
EC - 406	Programming in C	4		60	3	20	80	100
PRACTICAL:								

EC - 407	Linear Integrated Circuits Lab	-	4	60	3	40	60	100
EC - 408	Communication Skills	-	3	45	3	40	60	100
EC - 409	Digital Communication Lab	-	6	90	3	40	60	100
EC - 410	C and Matlab		3	45	3	40	60	100
TOTAL		26	16	630		280	720	1000

Engineering Mathematics – III

Subject Title : Engineering Mathematics – III

Subject code : EC-401(Common Subject)

Periods/Week : 04

Periods/semester : 60

Blue Print

S. No	Major Topic	No of Periods	Weightage of Marks	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 Subject)

Objectives

Upon completion of the subject the student shall 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

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.

Laplace Transforms(LT)

3.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)

Fourier Series

4. 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.

Probability

5 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 : 04
Periods/Semester : 60

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	16	2	1
2	Operational Amplifier	10	16	2	1
3	Op-Amp Applications	16	16	1	2
4	Non Linear Wave Shaping Circuits, Timers and PLL	16	29	3	2
5	Instrumentation amplifiers, A/D & D/A Converters	10	26	2	2
		60	**110**	**10**	**8**

OBJECTIVE:
The student will be able to

16.0 Explain the IC Manufacturing methods

16.1 List the advantages and disadvantages of **Integrated Circuits** over discrete assembly.
16.2 Classify ICs based on manufacturing process (monolithic, thin film, thick film and hybrid).
16.3 Describe the manufacturing process of monolithic ICs.
16.4 Describe the fabrication of resistor, and capacitor on monolithic IC.
16.5 Describe the fabrication of diode and transistor on monolithic IC.
16.6 List different IC packages.
16.7 Draw the shape of above package types
16.8 Mention the power rating of above packages.
16.9 Explain various levels of integration (SSI, MSI, LSI, VLSI etc.,).

16.10 Explain the Surface Mount Technology (SMT)
16.11 List 6 merits of SMT Technology..

17.0 Understand the working Differential amplifiers and Operational amplifiers.

17.1 Draw and explain the differential amplifier.
17.2 State the function of an operational amplifier.
17.3 Draw the symbol of an operational amplifier.
17.4 State the important operational characteristics of ideal amplifier.
17.5 Define Input impedance, Open loop gain, Slew rate, CMRR, Input offset voltage, Input offset Current,
17.6 Draw the block diagram and pin out diagram of IC 741 and explain each block
17.7 Give the Pin configuration of IC 741
17.8 State the function of Each pin.
17.9 Give typical values of Open loop gain, Slew rate, CMRR, Input offset voltage, Input offset Current,
17.10 Explain the power supply requirements of Operational Amplifier.
17.11 Explain the Inverting amplifier configuration of Op Amp.
17.12 Draw the input and output waveforms
17.13 Explain the concept of virtual ground.
17.14 Derive the equation for voltage gain
17.15 Explain the effect of feedback on input impedance and Bandwidth.for inverting amplifier configuration
17.16 Explain the Non Inverting amplifier configuration of Op Amp.
17.17 Derive the formula for Voltage gain.
17.18 Explain the effect of feedback on input impedance and Bandwidth.for Non inverting amplifier configuration.
17.19 Explain the use of operational amplifier as i) inverter , ii) Buffer iii) Summing Amplifier iv)Scale changer v) Integrator vi) Differentiator
17.20 Explain single supply operation of Operational Amplifier.
17.21 Give the pin configuration of single supply Op Amps such as CA 3011 ,LM324
17.22 List 6 important features of above ICs

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18.0 Understand Operational Amplifier applications

18.1 Draw and explain OP-Amp Wein-bridge Oscillator circuit
18.2 State the conditions required for stable operation of above circuit
18.3 Draw and Explain RC Phase shift oscillator circuit using OP Amp
18.4 Explain Gain Bandwidth of OpAmp
18.5 Define Sweep Voltage.
18.6 State the fundamental consideration of sweep waveform.
18.7 Distinguish between voltage and current time-base generation and list their applications.
18.8 Draw and explain Bootstrap sweep circuit.
18.9 Draw and explain Miller's sweep circuit using op Amp.
18.10 Classify Multi vibrators.
18.11 Draw and explain the working of OP-Amp Bistable multi vibrator with waveforms.

18.12 Draw and explain the working of OP-Amp Monostable multivibrator with waveforms.
18.13 Draw and explain the working of OP-Amp Astable multi vibrator with waveforms.
18.14 List 6 applications of multivibrators
18.15 Draw and explain the working of OP-Amp Schmitt trigger circuit.
18.16 Understand the working principle of different OP-AMP circuits.
18.17 Use of opamp for implementing Active low pass and high pass filters of first order.
18.18 List the types of IC regulators and give the advantage of IC regulators
18.19 Explain the operation of fixed positive and negative voltage regulators.(using 7800 series and 7900 series)
18.20 Explain the operation of adjustable voltage regulator (LM317).

19.0 Understand Non Linear Wave Shaping Circuits, Timers and PLL

19.1 List the different types of clippers.
19.2 Explain the unbiased and biased clippers with waveforms
19.3 Explain the double ended clipper with waveforms
19.4 Explain the principle of clamper circuit with waveforms
19.5 Mention the applications of clippers and clampers
19.6 Draw the block diagram of 555 IC and explain.
19.7 Explain the working of astable multi using 555 IC.
19.8 Explain the working of Monostable Multivibrator using 555 IC.
19.9 Explain the concept of Phase locked loops
19.10 Draw and explain the block diagram of PLL – LM565.
19.11 Explain the operation VCO (LM566)
19.12 Define lock range of PLL
19.13 Define capture range of PLL.
19.14 Give design rules(Formulas) for implementing PLL circuit
19.15 List the applications of PLL.
19.16 Explain frequency multiplier and FM demodulator using PLL.

20.0 Understand Instrumentation amplifiers, A/D and D/A Converters.

20.1 Draw and explain the instrumentation amplifier using three Op-Amps
20.2 Advantages of instrumentation amplifier.
20.3 Explain the *Voltage to current* converter circuit.
20.4 List 3 applications of *Voltage to current* converter.
20.5 Explain the *Current to Voltage* converter circuit .
20.6 List 3 applications of *Current to Voltage* converter.
20.7 State the need for *A/D* and *D/A* conversion.
20.8 Explain the terms resolution, Accuracy, Monotonicity and settling time of D/A converter.
20.9 Explain D/A conversion using binary weighted resistors.
20.10 Explain D/A conversion using R-2R ladder network.
20.11 Explain A/D conversion using counter method.
20.12 Explain A/D conversion using successive approximate method

COURSE CONTENTS:

1. **IC Manufacturing** Classifications of ICs based on manufacturing process, IC packages , IC Regulators Transistor series and shunt regulators.

2. **Operational amplifiers** Differential amplifiers and Operational amplifiers**.** Parameters definitions.

3. **Operational Amplifier applications** –OP-Amp as summer, integrator, differentiator, inverter and multiplier.,OP-Amp as Sinr Wave and Square Wave generator(Wein Bridge Oscillators and Schmitt Trigger circuit).

4 **Non Linear Wave Shaping Circuits** Like Clippers and Clamper Circuits,555 Timer block diagram, 555 Timer as Astable and Monostable Multivibrator , voltage Control Oscillators and PLL.

5 **Instrumentation amplifiers** (three op-Amps type), A/D and D/A Converters, define the terms the terms resolution, Accuracy, Monotonicity and settling time of D/A converter. DAC and ADC using op-Amps.

REFERENCE BOOKS

1. Electronic Devices and Circuits by Bogart, TMH
2. Integrated Electronics by Milliman and Hallkias, TMH
3. Linear Integrated Circuits by Gaykwad,
4. Linear Integrated Circuits by Roy Chowdary
5. Linear Integrated Circuits by Clayton.

NETWORK ANALYSIS

Subject Title : NETWORK ANALYSIS

Subject Code : EC- 403

Periods/Week : 04

Periods/Semester : 60

Rationale ; Network analysis is a core subjects 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

Sl	Major topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Basics of electrical circuits and Kirchoff's laws	10	16	2	1
2	Network theorems	8	26	2	2
3	Mesh current and Node voltage analysis	12	26	2	2
4	Transient analysis	12	13	1	1
5	Two port networks	8	13	1	1
6	Filters and Attenuators	10	16	2	1
	Total	**60**	**110**	**10**	**8**

OBJECTIVES

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

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

1.1 Define active and passive elements.
1.2 Explain resistance, capacitance and inductance parameters.
1.3 Define energy source and classify the energy sources.
1.4 Explain ideal voltage source and ideal current source
1.5 Convert ideal voltage source to ideal current source and vice versa.
1.6 Explain the concept of mutual inductance as a circuit parameter
1.7 Mention the formula for coupling coefficient
1.8 Explain the Dot rule for coupled circuits
1.9 State limitations of Ohm's law.
1.10 State Kirchhoff's current law and Kirchhoff's voltage law.
1.11 Solve problems on KCL,KVL,

2.0 Understand the network theorems

2.1 State Thevenin's, and Norton's theorems
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 theorems.
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 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 the simple problems on series RL,RC circuits of DC excitation.

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, reciprocity in terms of Z,Y, h, ABCD parameters.

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

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 equalize circuit.

REFERENCE BOOKS

1. Circuit analysis by Hayt & Kemerly.
2. Network analysis by Van Valkenberg.
3. Circuits and Networks Sudhakar & Shyam Mohan TMH
4. Network Theroy-Joseph Adminster-Schaum Series

DIGITAL COMMUNICATIONS

Subject Title : Digital Communications

Subject Code : EC-404

Periods/Week : 04

Periods/Semester : 60

Rationale ; Digital communication is a core subject which gives a clear insight in to the concepts of digital telephony . 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	Digital Communication	14	26	2	2
2	Error Detection and Correction	12	16	2	1
3	Digital Modulation Techniques	12	26	2	2
4	Multiplexing Techniques	12	26	2	2
5	Telephone system	10	16	2	1
	Total	60	110	10	8

OBJECTIVES

On completion of the study of the subject the student shall 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 State the advantages and disadvantages of PAM
1.8 Explain the generation and demodulation of PAM with block diagram.
1.9 List the advantages and disadvantages of PAM.
1.10 Describe PWM and PPM with waveforms.
1.11 List three advantages and disadvantages of PWM
1.12 List three advantages and disadvantages of PPM
1.13 Compare PAM, PWM and PPM.
1.14 Define quantization,
1.15 Explain the process of quantization with waveforms.
1.16 Explain quantization noise.
1.17 Define bit rate, and dynamic range for PCM systems.
1.18 Describe the coding and decoding of a PCM signal.
1.19 Explain delta modulation with block diagram.
1.20 Explain the advantages of delta modulation over PCM.
1.21 Describe adaptive delta modulation with block diagram and waveform
1.22 Compare PCM, DM and ADM
1.23 Explain the operation of *Vocoders.*
1.24 Describe different data compression techniques.

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 advantages of ASK
3.8 List two disadvantages of ASK
3.9 Explain BFSK modulator with block diagram.
3.10 Explain Coherent BFSK demodulator.
3.11 Draw and explain FSK demodulator using PLL.
3.12 List two advantages and disadvantages of FSK
3.13 Draw and explain BPSK modulator.
3.14 Draw and explain BPSK demodulator.
3.15 List four advantages of BPSK
3.16 State the importance of Constellation diagram.
3.17 Explain QPSK and 8 PSK with constellation diagrams briefly
3.18 Compare ASK, FSK and PSK.
3.19 Explain Quadrature Amplitude Modulation (QAM).
3.20 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 advantages of TDM
4.5 List three disadvantages of TDM
4.6 Compare TDM and FDM
4.7 State the need for a modem in data communication.
4.8 Describe the operation of telephone modem.
4.9 Explain the difference between fax and data modem.
4.10 Explain cable modems.
4.11 Explain Digital Subscriber Line (DSL).
4.12 Explain Asynchronous Digital Subscriber Line (ADSL) technology
4.13 Describe ISDN
4.14 State the advantages of ISDN.

5.0 Know Telephone System.
5.1 Classify different switched telephone systems.
5.2 Describe 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 dialling.
5.8 Explain pulse dialling and DTMF.
5.9 State the advantages of DTMF.
5.10 Compare in-band and out-of-band signalling systems for telephony.
5.11 Explain briefly 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.
5.15 Explain IP telephony (VOIP).

COURSE CONTENT

1. Digital Communication and Digital Modulation.
Introduction to digital communication, Sampling theorem, pulse modulation, pulse code modulation, delta modulation, vocoders and data compression techniques.

2. Data Transmission
Data coding, asynchronous transmission, synchronous Transmission, error detection and correction: Parity check, VRC, LRC, Checksum, CRC, hamming code, symbol substitution method.

3.Digital Modulation Techniques
Digital modulation, Amplitude shift keying(ASK), frequency shift keying (FSK), phase shift keying (PSK), QPSK,8PSK, Constellation diagrams, quadrature amplitude modulation (QAM).

4. Multiplexing techniques.
Multiplexing techniques: FDM and TDM, Telephone modem, fax modem and data modem, cable modem, digital subscriber lines, ADSL,ISDN

5. Telephone System.

Public switched telephone network(PSTN), manual and electronic Telephony , the local loop, signals on local loop, in band and out band signalling, SS-7system,FDM and TDM in telephony, Internet telephony.

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.
6. Digital communication Theory, Techniques & applications, by R.N Mutagi, Oxford university press
7. Communication systems by V. Chandrasekhar, Oxford university press.
8. Data Communications and networking by VBehrouz A Forouzan, TMH

MICROPROCESSOR & MICROCONTROLLER PROGRAMMING

Subject Title : Microprocessor & Microcontroller Programming
Subject Code : EC-405
Periods/Week : 04
Periods/Semester : 60

Rationale ; Microprocessors &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 Industry ready .

TIME SCHEDULE

Sl.	Major Topics	No. of Periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Introduction to 8085 architecture, timing diagrams	16	21	2	1 ½
2	Architecture of 8051	14	18	1	1 ½
3	Instruction set	12	29	3	2
4	Programming of 8051	12	26	2	2
5	Applications using 8051	06	16	2	1
	Total	**60**	**110**	**10**	**8**

OBJECTIVES

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

1.0 Comprehend the architecture of Microprocessor 8085

1.1 Draw the block diagram of a microprocessor and explain the function of each block.
1.2 List the features of micro processors
1.3 Give the functional block diagram of 8085
1.4 Explain multiplexing of Address and Data Bus
1.5 Explain the register structure of 8085.
1.6 Explain the function of various registers.
1.7 Draw the pin out diagram of 8085
1.8 Explain the terms operation code, operand and illustrate these terms by writing an instruction. Understand the hex code for the same

1.9 Explain fetch cycle, execution cycle and instruction cycle
1.10 Explain execution of STA, LDA, IN, OUT instructions.
1.11 Draw the timing diagrams of the above instructions, and understand thoroughly in terms of clock cycles
1.12 List the latest processors used in Desktop/Laptop computers
1.13 Mention their important specifications .

2.0 Comprehend the architecture of Microcontroller 8051

2.1 List the features of micro controllers.
2.2 Compare Microprocessors and Microcontrollers
2.3 Draw the block diagram of a microcomputer and explain the function of each block.
2.4 Give the details of 8051 microcontroller family chips.
2.5 Give the functional block diagram of 8051 microcontroller
2.6 Draw the register structure of 8051and explain.
2.7 Explain the function of various special function registers.
2.8 Give the pin diagram of 8051 micro controller and specify the purpose of each pin.
2.9 Describe internal memory, external memory and ports of 8051.
2.10 Explain counters & timers in 8051
2.11 Explain serial input/output of 8051
2.12 Explain interrupts in 8051
2.13 Describe different modes of operation.

3.0 Comprehend the instruction set of 8051 micro controller

3.1 State the need for an instruction set.
3.2 Give the instruction format of 8051.
3.3 Explain fetch cycle, execution cycle and instruction cycle.
3.4 Distinguish between machine cycle and T-state.
3.5 Explain the timing diagram for memory write, memory read operations of 8051.
3.6 Define the terms machine language, assembly language, and mnemonics.
3.7 Give the difference between machine level and assembly level programming.
3.8 List the major groups in the instruction set along with examples.
3.9 Explain the terms operation code, operand and illustrate these terms by writing an instruction.
3.10 Explain the data manipulation functions, data transfer, arithmetic, logic and branching with examples
3.11 Classify the 8051 instructions into one byte, two byte and three byte instructions.
3.12 List the various addressing modes of 8051and Explain with examples.
3.13 Explain data transfer instructions of 8051.
3.14 Explain the arithmetic instructions and recognise the flags that are set or reset for given data conditions.
3.15 Explain the logic instructions and recognize the flags that are set or reset for given data conditions.
3.16 Illustrate the logic operations and explain their use in making, setting and resetting of individual bits.
3.17 Explain unconditional and conditional jump and how flags are used to change the sequence of program.

4.0 Comprehend Programming Concepts

4.1 List the various symbols used in drawing flow charts.
4.2 Draw flow charts for some simple problems.

4.3 Write programs in mnemonics to illustrate the application of data copy instructions and translate these mnemonics into hex codes.
4.4 Write programs of instructions to perform single byte, double byte and multi byte addition and subtraction.
4.5 Illustrate the application of jump instruction in the program.
4.6 Write a program using counter techniques.
4.7 Define a subroutine and explain its use.
4.8 Explain the sequence of program when subroutine is called and executed.
4.9 Explain information exchange between the program counter and the stack and identification of stack pointer register when a subroutine is called.
4.10 List and explain unconditional and conditional call and return instructions.
4.11 Use PUSH, POP instructions in programs.
4.12 Illustrate the concept of nesting, multiple ending and common ending in subroutines.
4.13 Use input/output, machine related statements in writing assembly language programs.
4.14 Explain the term debugging a program.
4.15 List the important steps in writing and trouble shooting a simple program.
4.16 Explain the principles of single step and break point debugging techniques.
4.17 Write instructions to set up time delay.

5.0 Programming for Applications using 8051
5.1 Describe the Interfacing of push button switches and LEDs.
5.2 Describe the Seven segment display interface
5.3 List reasons for the popularity of LCDs
5.4 Describe the functions of pins of LCD
5.5 List instruction command code for programming a LCD
5.6 Explain Interfacing LCD to 8051
5.7 Program LCD in assembly language
5.8 Explain the basic operations of keyboard
5.9 Explain key press and detection mechanisms
5.10 Explain Interfacing a 4 X 4 Matrix Key Board.
5.11 Explain RS232 standards
5.12 List RS232 pin , DB 25 and DB 9 connectors
5.13 Explain MAX 232 and 233 and interfacing

COURSE CONTENT

1. ARCHITECTURE OF 8085

Block diagram of microcomputer, Block diagram of 8085, Pin out diagram of 8085, registers, timers, interrupts, modes of operation-address and data bus multiplexing-. Instructions-instruction cycle-timing diagrams

2. ARCHITECTURE OF 8051:

Block diagram of microcomputer, Block diagram of 8051, Pin out diagram of 8051, registers, timers, interrupts, fetch cycle, execution cycle, machine cycle

3. INSTRUCTION SET OF 8051:

Instruction set of 8051, instruction format, fetch cycle, execution cycle, instruction cycle, machine cycle, timing diagrams, machine language, assembly language, classification of instructions, addressing modes- Groups of instructions, opcode, operand

4. PROGRAMMING CONCEPTS:

Flow charts, Data transfer, single and multi byte addition and subtraction, subroutines, nesting, multiple ending and common ending, use of Input output and machine related statements, debugging, time delay program.

5. APPLICATIONS PROGRAMMING:

Interfacing of various hardware circuits for applications-push button switches - LEDs-Seven segment display-Matrix Key Board- ADC chip - DAC chip- DC motor- Stepper motor

REFERENCE BOOKS:

1. 8085-Micro Processors by Ramesh S Gaonkar
2. 8051 Micro controller by Mazidi and Mazidi.
3. 8051 Micro controller by Kenneth J. Ayala.
4. Programming customizing the 8051 Microcontroller by Myke Predko, TMH
5. Introduction to microprocessors for engineers and scientists by by Ghosh & Sridhar, Prentice-Hall.
6. 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 : 04
Periods / Sem. : 60

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	10	16	2	1
2	Decision & Loop Control Statements	10	26	2	2
3	Arrays & Strings	10	26	2	2
4	Functions and Pointers in C	18	26	2	2
5	Structures, Unions & Pre-processor Directives	12	16	2	1
	Total	**60**	**110**	**10**	**08**

OBJECTIVES

On completion of the study of this subject a student shall 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 List the five Arithmetic Operators
1.4 Define an expression and show how to evaluate.
1.5 Explain writing the assignment statement.
1.6 Explain the increment and decrement operators.
1.7 Identify compound Assignment Operators.
1.8 Explain the Nested assignments.
1.9 Explain printf ()and scanf () functions
1.10 Mention various type conversion techniques and discuss them.
1.11 List the four relational operators.
1.12 List the three logical operators supported by 'C'
1.13 Give the operator precedence.
1.14 Evaluate a logical expression.
1.15 Explain bitwise logical operators.

2.0 Understand Decision & Loop Control Statements

2.1 State the importance of conditional expression.
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 Explain the nested loops
2.9 write simple programs based on nested loops
2.10 Differentiate break and continue statements.
2.11 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 the initialization of the above arrays & Access Array elements.
3.3 Explain Passing array elements as arguments and arrays as arguments.
3.4 Define string
3.5 List three functions used for reading strings
3.6 List three functions used for writing strings.
3.7 Write the operation of getchar(), getch(), getche() and putchar() functions.
3.8 Write the operations of string manipulation functions strcat(), strchr(), strncmp(), strcpy(), and strlen()
3.9 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
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 Recursion and Explain with examples.
4.10 Declare a pointer, assign a pointer, and initialize a pointer.
4.11 Discus pointer arithmetic.
4.12 Differentiate address and de referencing operators.
4.13 Illustrate with an example how pointer can be used to realize the effect of parameter passing by reference.
4.14 Illustrate with examples the relationship between arrays and pointers.
4.15 Discuss pointer arrays with example.
4.16 Describe concept of pointers to functions.

5.0 Understand Structures, Unions and preprocessor directives

5.1 Define a structure
5.2 Describe structure variable.

5.3 Explain initialization of structures.
5.4 Explain the accessing of members of a structure.
5.5 Illustrate concept of structure assignment
5.6 Explain how to find size of a structure.
5.7 Discuss 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 Illustrate the concept of structures containing pointers.
5.11 Define a Union
5.12 Explain the use of a union.
5.13 List six unconditional preprocessor directives.
5.14 List six conditional preprocessor directives.
5.15 Explain the preprocessing directives: define, include, ifdef, ifndef.

COURSE CONTENT

1. C-Programming Basics

Structure of a C programme, Programming rules, Character Set, Delimiters Keywords, Constants, Variables, Data types, Type conversion. Arithmetic, Logical, Relational operators and precedence – Assignment, Increment, Decrement operators, evaluation of expressions. Console IO formatted and unformatted functions.

2. Decision and Loop control Statements

If, If-else, Nested If else, Break, Continue, Goto and Switch statements Loops:- For, While, Do-while, Nesting of Loops.

3. Arrays and Strings

1 D Array declaration, Initialization, 2 D Array declaration, Initialization, Accessing of Array elements, Character Arrays declaration and Initialization of Strings, Display of strings with format.

4. Functions and pointers in C

Function-Definition, Declaration, Return statement, passing parameters to function- Function calls, Nesting of functions and Recursion Storage classes of variables, Scope and visibility. Pointer declaration, Arithmetic operations and pointers, Pointers and Arrays

5. Structures, Unions and preprocessor directives

Structure features, Declaration and Initialization, Structure within a structure, Array of structure, Accessing of Structure members, Structures and functions, Unions. Preprocessor directives.

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 LABORATORY PRACTICE

Subject Title	:	LINEAR INTEGRATED CIRCUITS LAB PRACTICE
Subject Code	:	EC-407
Periods/Week	:	06
Periods/Semester	:	90

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**	12
II.	**Wave shaping Circuits**	12
III.	**Opamp Oscillators &555 Timer IC**	12
IV.	**Phase locked loops**	12
V.	**Op Amp applications**	12
VI	**Circuit simulation using Pspice**	36
	Total	90

List of Experiments

I. Operational Amplifier Circuits

1. Familiarize with Operational amplifier 741 and Quad opamp LM 324 and comparator LM 339 Ics

2. To Determine the CMRR and Slew Rate of the OP-AMP.

3) To Implement and test 741 OpAmp as

a) inverting amplifier

b) Non Inverting amplifier

c) Voltage follower (Buffer),

4) To implement and test 741 Operation amplifier as

a)summing Amplifier

b) Difference amplifier

c) Scale changer (with two OpAMps)

II. Wave shaping Circuits

5. To Realize Clipper and Clamper circuits and observe the waveforms on CRO

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) 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

6. To implement Wave shaping circuits using OpAmp

a)To implement &test Differentiator and Integrator circuits .

b) To implement &test a Voltage comparator Circuit

c) To implement &test Opamp Schmitt trigger and draw charactersistics

III. Signal conditioning Circuits using Opamp

7) To implement &test **Signal conditioning Circuits using Opamp**

a) To Interface op amp output with TTL gates with input amplitude limiting circuit

b) To implement &test Current to Voltage converter using Op amps

c) To Implement &test Current to Voltage converter and use it to detect photodiode reverse current.

8. To implement &test Voltage to current converter

a)To 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) To implement & test Sine wave Oscillator Circuits using OpAmp CA 3011

a) RC-phase shift oscillator

b) Wien bridge oscillator

) To implement Op-Amp Relaxation Oscillators

a) To implement &test Monostable multivibrator circuit and observe output waveforms on CRO

b) To Implement &test Astable multivibrator observe output waveforms on CRO

10) To Verify different modes of 555 IC.

a) To Implement Monostable multi vibrator and observe output waveforms on CRO

b) To Implement Astable multivibrator and observe output waveforms on CRO

11) To verify functions of 565 Phase Locked loop IC

A) To 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 implement Frequency demodulator using 565 and observe output waveform on CRO.

12) To Use 566 as a square and Triangular wave generator

a) To implement waveform /Function generator using 566 .
b) To produce Frequency modulation using 566 and observe output waveform on CRO.

13)To verify the features of Tone Decoder IC 567 IC

(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 .
c) To implement Quadrature output Oscillator and Test.

14) To implement D/A converter using R-2R ladder network/Binary Weighted type.

A) Implement D/A converter using Opamp and R-2R ladder and Binary weighted network and test
a) To Implement &Test Precision Rectifier using Opamp

15) To implement Opamp active filters and evaluate the performance

a) To implement active low pass filter
b). To implement Active High pass filter

16) To assemble Audio Power Amplifiers using LM 380 IC and Test the performance.

17) To Practice PSpice simulation

a) Simulate the experiments 4,5,6,8,9,10, 15 using Pspice

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)**	➢ Identify 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

		➢ 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	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 (6)** a) inverting amplifier b) Non Inverting amplifier c) Voltage follower (Buffer),	➢ 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 implement and test 741 Operation amplifier as(6)** 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	➢ 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

	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) 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		circuits in practical applications
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 ➢ 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 ➢ 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 & 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
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	➢ familiarize with 565 pin configuration Choose correct values for frequency determining components ➢ Rig up the circuit ➢ Observe & measure the output waveform	➢ Choose correct values for frequency determining components ➢ Rig up the circuit ➢ Observe & measure the input & output waveform on CRO ➢ Change RC component Values &

	output waveforms on CRO b) To design & implement Frequency demodulator using 565 and observe output waveform on CRO.	on CRO Change RC component Values & Observe the effect on output signal on CRO ➢ Interpret the specifications of 565 IC from datasheets	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 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 output waveform on CRO Change RC component Values & Observe the effect on 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 . c) To implement	➢ 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	➢ 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

	Quadrature output Oscillator and Test.	➢ Interpret the specifications of 566 IC from datasheets	from datasheets
14	**To implement Opamp active filters and evaluate the performance (3)** a) To implement active low pass filter b). To implement Active High pass filter	➢ Choose correct values for cut off frequency determining components Assemble the circuit ➢ Apply correct level signals to prevent output distortion ➢ Observe & measure the output waveform on CRO ➢ Change RC component Values & Observe the effect on output signal on CRO	➢ Choose correct values for cut off frequency determining components ➢ Observe & measure the output waveform on CRO ➢ Change RC component Values & Observe the effect on output signal on CRO
15	**To implement &Test D/A converter using R-2R ladder network/Binary Weighted type. (3)** 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	➢ Assemble the circuit ➢ Apply binary input signal ➢ Measure the output voltage with DMM ➢ Refer to the data sheets and note down the number of IC version of D/A converter and specifications	➢ Apply binary input signal ➢ Measure the output voltage with DMM
16	**To assemble Audio Power Amplifiers using**	➢ Familiarize with pin configuration of LM 380	➢ Assemble the circuit (without speaker)

	LM 380 IC and Test the performance. (9)	IC ➢ Assemble the circuit (without speaker) ➢ Carry out Performance test (Frequency response) ➢ Connect the Microphone & speaker and test	➢ Carry out Performance test (Frequency response) ➢ Connect the Microphone & speaker and test
17	**Pspice simulation (30)** a) Simulate the experiments 4,5,6,8,9,10, 15 using Pspice	➢ Draw the circuit ➢ Assign values to components ➢ Debug ➢ simulate the circuit & save ➢ Interpret the results .	➢ Assign values to components ➢ Debug ➢ simulate the circuit & save ➢ Interpret the results

Communication Skills Lab Practice
(Common to all Branches)

Subject title : Communication skills
Subject code : EC-408
Periods per week : 3
Periods per semester : 45

Introduction :

In the context of globalization , competence in speaking skills is the need of the hour The gap between the needs of the industry and the curriculum can be bridged by enabling the students to hone their speaking and listening skills. This course aims at providing opportunities for practicing speaking.

Time Schedule

Sno.	Topic	Periods	Weightage of marks (End Exam)	Sessional marks	Total
1	Listening I	3			
2	Listening II	3	10	10	20
3	Introducing oneself	3			
4	Describing objects	3			
5	Describing events	3			
6	Reporting past incidents	3			
7	Speaking from observation / reading	3	50	30	80
8	JAM	6			
9	Group discussion	6			
10	Mock interviews	6			
11	Making presentations	6			
		45	60	40	100

Objectives :

On completion of the course the students will be able to

- Strengthen their listening skills
- Strengthen their speaking skills

Competencies and key competencies to be achieved by the student

Topic	**Teacher's input/ methodology**	**Students competence**
Listening I Listening II	Pre- Listening –eliciting, pictures While - Listening Post –Listening –project , writing	Identifying the main idea, Identifying specific details, Identifying parallel and contradictory ideas Drawing inferences, Reasoning
Introducing oneself	Kinds of introduction --official/ personal, dynamic vocabulary, Body language, Model introduction, Use of line ups	Use of simple present tense, Sequencing, Appropriate vocabulary
Reporting incidents	Group work /pair work, Elicit, Use of past tense, Student presentations	Use of past tense, Relevant vocabulary
Describing objects	Vocabulary , Use of adjectives, Games—I spy, Group presentations	Use of adjectives, Dimensions,shapes Compare and contrast, sequence
Describing events	Group work/pair work Use of appropriate tense	Use of appropriate tense, sequencing

Reporting past incidents	Use of past tense, Vocabulary Student presentations	Use of past tense , sequencing
Speaking from observation/reading	Group work/pair work, Reading techniques ,	Use of past tense, Summarising , evaluating, comprehension
JAM	Effective techniques , Good beginning , conclusion, tips, Use of line ups	Vocabulary, Sequencing, Fluency, Thinking spontaneously
Group discussion	Expressing opinion, body language,	Expressing opinion, agree/ disagree, fluency,Persuasive and leadership skills
Mock interview	FAQs , body language	Role play, body language,
Making presentations	Student presentations	Using charts , pictures, interpreting data, sequencing,PPTs

Communicative methodology (CLT) should be used to create an interactive class. Apart from the suggestions given teachers are free to innovate to use any activity to improve the language competence of students . Attention can also be given to improve the accent and intonation of students.

Note:

* This subject is a theory subject.

** The workload should be calculated as theory workload.

***Examinations in the subject will be treated as a practical one.

DIGITAL COMMUNICATION LAB PRACTICE

Subject Title : Digital Communication Lab Practice

Subject Code : EC – 409

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**	**15**
2	**Time Division &Frequency Division Multiplexing**	**6**
3	**Signal Encoding (Keying) Techniques**	**9**
4	**DTMF Signalling**	**3**
5	**MatLab Practice**	**12**

LIST OF EXPERIMENTS

I. Pulse Modulation Techniques

1. To implement an opamp sample and hold circuit and test

2. To verify sampling theorem and observe waveforms on CRO

b) To sample an analog signal (using IC 398) at Nyquist rate and above Nyquist rate. And observe the waveforms

3. To Verify and observe Pulse amplitude modulation and demodulation waveforms on CRO

4.To observe pulse position modulation and demodulation waveforms on CRO

5. To Verify and observe Pulse Width modulation and demodulation waveforms on CRO

6.To Verify and observe Pulse Code Modulation and Demodulation waveforms on CRO

II. Time Division &Frequency Division Multiplexing

7. To Verify 2-channel TDM and observe input/output waveforms on CRO

8. To demonstrate FDM. and observe input/output waveforms on CRO

III.Signal Encoding (Keying) Techniques

9. To generate and demodulate ASK signal and observe input/output waveforms on CRO

10. To generate and demodulate FSK signal and observe input/output waveforms on CRO

11. To generate and demodulate PSK signal

12.To observe line encoder &Decoder (NRZ Signal) waveforms on CRO for

a) Unipolar and b) Bipolar techniques

IV. DTMF Signalling

13. To generate DTMF signals using UM91214B IC/5089IC or any other equivalent ICs

a)To demonstrate DTMF decoder using 8870 IC or its equivalent

V. Matlab Practice (Program should be given)

14) To Enter and execute a Matlab program to generate ASK signal. Debug any programming mistakes

15)To Enter and Execute a Matlab program to generate FSK signal. Debug any programming mistakes.

16) To Enter and Execute a Matlab program to generate PSK signal. Debug any programming mistakes.

17)To Enter a program to generate DTMF Signals and execute using Matlab. Debug any programming mistakes

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	➢ 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	➢ Apply correct level signal at input ➢ Measure and observe output waveforms on CRO ➢ Observe the effect of sampling rate on the output signal.

		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	
2	To verify sampling theorem and observe waveforms on CRO 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
3	To Verify and observe Pulse amplitude modulation and demodulation waveforms on CRO	➢ 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
4	4.To observe pulse position modulation and demodulation waveforms on CRO	➢ Make connections ➢ identify various sections in PPM Board ➢ Apply correct level signal at input ➢ Measure and observe input/output waveforms on CRO ➢ Identify PPM signal	➢ Apply correct level signal at input ➢ Measure and observe input/output waveforms on CRO ➢ Identify PPM signal

5	To Verify and observe Pulse Width modulation (PWM)and demodulation waveforms on CRO	➢ 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
6	To observe line encoder &Decoder (NRZ Signal) waveforms on CRO 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
7	To Verify and observe Pulse Code Modulation and Demodulation waveforms 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

8	To Verify 2-channel TDM and observe input/output waveforms on CRO	➢ 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
9	To Verify FDM. and observe input/output waveforms on CRO	➢ 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
10	To generate and demodulate ASK signal and observe input/output waveforms on CRO	➢ 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
11	To generate and demodulate FSK signal and observe input/output waveforms.	➢ Identify various sections in FSK modulator Demodulator board ➢ Make connections ➢ Apply correct level signals	➢ Make connections ➢ Apply correct level signals at input ➢ Measure & observe carrier and

		at input ➢ Measure and observe input/output waveforms on CRO	Baseband signals on CRO
12	To generate and demodulate PSK signal	➢ 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
13	To generate DTMF signals using UM91214B IC/5089IC or any other equivalent ICs a)To verify thew 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
14	To Enter and execute a Matlab program to generate ASK signal.	➢ Enter the program ➢ Follow the syntax ➢ Debug the program ➢ Execute the program	➢ Follow the syntax ➢ Debug the program ➢ Execute the program
15	To Enter and Execute a Matlab program to generate FSK signal..	➢ Enter the program ➢ Follow the syntax ➢ Debug the program ➢ Execute the program	➢ Follow the syntax ➢ Debug the program ➢ Execute the program

16	To Enter and Execute a Matlab program to generate PSK signal.	➢ Enter the program ➢ Follow the syntax ➢ Debug the program ➢ Execute the program	➢ Follow the syntax ➢ Debug the program ➢ Execute the program
17	To Enter a program to generate DTMF Signals and execute using Matlab.	➢ Enter the program ➢ Follow the syntax ➢ Debug the program ➢ Execute the program	➢ Follow the syntax ➢ Debug the program ➢ Execute the program
18	To enter a program to generate PCM signal using Matlab	➢ Enter the program ➢ Follow the syntax ➢ Debug the program ➢ Execute the program	➢ Follow the syntax ➢ Debug the program ➢ Execute the program

Programming with C and MATLAB Practice

Subject Title : Programming with C & MAT LAB Practice
Subject Code : EC- 410
Periods/Week : 06
Periods/Semester : 90

Rationale ; Programmingwith C Lab Practice is introduced to reinforce the programming skills learnt in the class Room . Mat Lab is also included to give an opportunity to the students to understand the design concepts by simulate electronic circuits .

TIME SCHEDULE

Sl	Major Topic	No. of Periods
1	C Programming Basics	6
2	Decision & Loop Control Statements	12
3	Exercises on functions	15
4	Arrays, Strings and Pointers in C	15
5	Structures, Unions & Preprocessor Directives	12
6	MAT Lab Practice	30

LIST OF EXPERIMENTS

I. C Programming Basics

1. To familiarize with turbo Compiler features.
2. To practice formatted Input /Outpt (printf and scanf) functions.
3. To Practice with Various Operators in C

II. Decision & Loop Control Statements

4. To practice with Decision & Control (if, if-else, nested if –else) Statements
5. To practice with Decision control (Switch –case structure) statements
6. To practice with loop control Statements

III. Exercises on functions

7. To practice the use of functions in C

IV. Arrays, Strings and Pointers in C

8. To practice single dimensional integer arrays

9. To practice multidimensional integer arrays .
10. To Practice string functions for string comparison , copying and concatenation
11. To practice with pointers in 'C'

V. Structures, Unions & Preprocessor Directives

12. To practice the use of Structures in C
13. To practice with C preprocessor Directives.
14. To practice command line arguments in C

VI. MAT LAB PRACTICE

1. To get familiarized with Matlab environment
    a. To create and work with array of numbers
    b. to create and print simple plots
    c. to create , save & Execute a script file
    d. to create & Execute a function file
2. To work with arrays and matrices
3. To Create anonymous Function and use.
4. To define a function symbolically
5. To import data from MS excel sheet
6. To work with files and directories
7. To publish a report
8. To use built in Functions of Matlab
9. To plot simple graphs using fplot function
10. To plot simple graphs using ezplot function
11. To plot simple graphs using ezsurfc function
12. To write a simple script file and execute it
13. To write a simple function file and execute

14. To design an inverting amplifier using matlab and plot performance characteristics (Program to be given)

C lab Practice – (PART A)

Competencies and Key Competencies to be achieved

Exp No	Name of the Experiment (No of periods)	Competencies	Key Competencies
1	To familiarize 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 Input /Outpt (printf and scanf) functions.(2)	➢ Enter the program in 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	➢ Handle string data and 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	➢ Use assignment operators, Arithmetic operators, precedence operators , Relational &logical operators ➢ debug and Compile ➢ Execute and save with appropriate name

		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 Decision control (Switch –case structure) statements(3)	➢ Enter the program in standard format following syntax in text editor ➢ Use Switch statement, ➢ debug and Compile ➢ Execute and save with appropriate name	➢ Use Switch statement,
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	➢ Function declaration ➢ Declare local variables, formal parameters &Global variables ➢ Use Calling by value ➢ Use Calling by reference ➢ Use nesting of function calls

		appropriate name	
	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
8	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
9	To practice multidimensional integer arrays(3)	➢ Enter the program in standard format following syntax in text editor ➢ Define 2 dimensional array ➢ Use Array initialization ➢ Use arrays as arguments in functions	➢ Define 2 dimensional array ➢ Use Array initialization ➢ Use arrays as arguments in functions

		➢ Debug and Compile ➢ Execute and save with appropriate name	
10	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
11	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
12	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 ➢ Initialization of structure array ➢ Debug and Compile ➢ Execute and save with appropriate name	➢ Define structure ➢ Give assignment statement ➢ Initialization of structure array ➢ Debug and Compile
13	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	➢ Use #define, #if, #ifdef, #else, #elif, #include pre-processor directives in the program

		the program ➢ Debug and Compile ➢ Execute and save with appropriate name	

MATLAB Practice – (PART B)

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 create a program ➢ Use basic commands ➢ Creating Directory, Checking current directory ➢ saving files ➢ Quit Matlab	➢ Identify Current folder, Current window , Work space &Command history ➢ Use editor/Debugger to create a program ➢ 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	➢ Enter the Expression using Matlab notations and hierarchy ➢ Debug ➢ Solve and verify the

		➢ Debug ➢ Solve and verify the results	results
4	To work with arrays and matrices (3) b) To find determinant of a matrix using matlab	➢ Open Matlab & access the appropriate directory &File ➢ Enter the program in 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 the program in 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
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 graphs ➢ Debug and Compile	➢ 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

		➢ 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 ➢ Debug and Compile ➢ Execute and save with appropriate name ➢ Publish to word file	➢ 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 ➢ 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	➢ Identify blocks &terminals ➢ Gather the appropriate Blocks (sine wave , gain , Scope)

		Blocks (sine wave , gain , Scope) ➢ Connect blocks ➢ Run simulation	➢ 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

Note: End Examination should constitute experiments from Part A and B

Reference Book:

Getting started with MATLAB by Rudra Pratap, Oxford university Press

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
V Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / Sem	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
EC-501	Advanced Communications	4	-	60	3	20	80	100
EC-502	Consumer Electronics	4	-	60	3	20	80	100
EC-503	Computer Hardware	4	-	60	3	20	80	100
EC-504	Optical Fibre Communication	4	-	60	3	20	80	100
EC-505	Microcontroller Applications	4	-	60	3	20	80	100
EC-506	Data communication & Computer Networking	4	-	60	3	20	80	100
PRACTICAL:								
EC-507	Computer HW & Networking Lab	-	6	90	3	40	60	100
EC-508	**Life skills**	-	3	45	3	40	60	100
EC-509	Microcontroller applications lab	-	3	45	3	40	60	100
EC-510	Field Practices	-	6	90	3	40	60	100
	TOTAL	24	18	630		280	720	1000

ADVANCED COMMUNICATION SYSTEMS

Subject Title : Advanced Communication Systems

Subject Code : EC-501
Periods/Week : 04

Periods/Semester : 60

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	10	16	2	1
2	Microwave components and Tubes	14	26	2	2
3	Microwave semiconductor devices and MICs	10	16	2	1
4	RADAR	13	26	2	2
5	Satellite Communication	13	26	2	2
	Total	60	110	10	8

OBJECTIVES

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

1.0 Transmission Lines

1.1 List different types of Transmission Lines.
1.2 Draw the Electrical equivalent circuit of a Transmission line.
1.3 Define Primary and Secondary constants of a Transmission line.
1.4 Explain the transmission line equations
1.5 Derive the expressions for attenuation and phase constants
1.6 Define group and phase velocities in transmission lines
1.7 Explain the concept of Infinite Line

1.8 Define lossless 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 Explain the need for impedance matching in transmission lines.
1.14 Impedance Matching using quarter wave transmission line.
1.15 Explain single stub matching in transmission lines.

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 Describe 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 operation of E-Plane Tee and H-Plane Tee.
2.10 Explain the operation of Magic Tee
2.11 State the need for isolators and circulators
2.12 Explain the operation of Isolator
2.13 Explain the operation of Circulator.
2.14 Explain the construction and working of Multi cavity Klystron amplifier.
2.15 List the applications of Multi cavity Klystron.
2.16 Cavity resonator
2.17 Explain the construction and 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 applications of Magnetron.
2.21 Explain the construction and working of Travelling Wave Tube amplifier
2.22 List 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 Describe 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 operation 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 working of micro-strip antenna
3.13 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 operation of branch type Duplexer with sketch.
4.7 List the types of indicators used in radar systems.
4.8 Briefly explain A-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 State the need for satellite communication
5.2 Define foot print of a satellite
5.3 Describe the basic structure and uses of microwave links.
5.4 Explain fixed microwave link with block diagram.
5.5 List the advantages of satellite communication over terrestrial radio communication.
5.6 Explain geostationary satellites and satellites in lower orbits.
5.7 List the advantages and disadvantages geostationary satellites.
5.8 Define azimuth and elevation with reference to satellites.
5.9 Define terms apogee and perigee.
5.10 Define uplink frequency and down link frequency
5.11 List the functions of a transponder
5.12 List three types transponders used in satellites (single conversion, double conversion and regenerative)
5.13 Explain the working of the three types of transponders.
5.14 Explain bandwidth allocation of a satellite.
5.15 List the three methods of increasing satellite capacity
5.16 Explain the methods of increasing channel capacity. Frequency reuse, polarization and spatial isolation).
5.17 Draw and explain the block diagram of communication satellite.
5.18 Draw and explain the block diagram of Earth station.
5.19 Explain the working of GPS
5.20 List the applications of satellites.

COURSE CONTENT

1. Transmission Lines

Introduction-electrical equivalent circuit-primary constants- characteristic impedance-propagation constant-infinite line-lossless line-condition for distortion less line-reflection coefficient-SWR-impedance matching-quarter wave line-stub matching-rectangular waveguide-modes of operation-dominant mode in rectangular waveguide-cut off wavelength-group velocity-phase velocity

2. Microwave components and Tubes

Introduction to microwave devices -microwave bends-corners-twists-tees-circulators-isolators-Multi cavity Klystron-Reflex Klysron-Magnetron-TWT-applications.

3. Microwave semiconductor devices and MICs

GUNN Effect-GUNN diode-Tunnel diode-IMPATT-TRAPATT-MICs-applications

4. RADAR

Introduction to Radar system-Radar range equation - Pulsed Radars-Indicators-Duplexer-CW radar-FM CW Radar-Radar altimeter-MTI Radar-Instrument landing system

5. Satellite Communication

Microwave link-advantages of satellite communication system - Frequency bands-bandwidth-channel capacity-communication satellite-Earth station-GPS-applications of satellites

REFERENCE BOOKS

1. Electronic communication system by George Kennedy, TMH
2. Electronic Communication Systems by Blake. Thomson
3. Introduction to RADAR Engineering by Merryl I Skolnik. TMH
4. Microwave Integrated circuits by Samuel Leo

CONSUMER ELECTRONICS

Subject Title : CONSUMER ELECTRONICS
Subject Code : EC-502
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	Microphones & Speakers	10	21	2	1 ½
2	Audio Systems	8	13	1	1
3	TV Picture & Composite Video Signal	16	23	1	2
4	Colour T.V.	8	21	2	1 ½
5	Cable, Satellite and digital TV	10	16	2	1
6	Domestic Appliances	8	16	2	1
	Total	**60**	**110**	**10**	**8**

OBJECTIVES

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

1.0 Understand basics of audio systems.
Familiarise with different types of microphones and loud speakers

1.1 List the different types of microphones based on impedance, polar characteristics and principle of working.
1.2 Explain the working of carbon, condenser, Crystal, ribbon and dynamic microphones along with their polar characteristics.
1.3 Compare the parameters like sensitivity, noise, frequency response, directivity, output impedance, bias necessity, size, cost and applications of above microphones.
1.4 List the ratings of condenser, crystal, carbon, ribbon and dynamic microphones.

1.5 Explain the constructional features and principle of operation of PMMC Loudspeaker and its ratings.
1.6 Mention the necessity of Baffle for a Loudspeaker and types of Baffles (like open, infinite, bass reflex, acoustic labyrinth) and constructional details.
1.7 Mention the use of woofers and tweeters.
1.8 Give the need for a Horn loud speaker with its construction and advantages. Mention different types of horns.
1.9 Compare the performance characteristics of cone type and horn type loud speakers.
1.10 Explain the principle, construction and working of magnetic and crystal headphones and their uses.
1.11 Mention the specifications of Loudspeaker and Microphones

2.0 Understand Audio & Video Systems

2.1 Define speech, music and noise.
2.2 Explain frequency response and equalization.
2.3 Define the concept of Hi-Fi and Stereo.
2.4 State the need of bass, treble, balance, and volume control in stereo amplifier.
2.5 Explain a simple circuit showing the above controls.
2.6 Briefly explain the principle of magnetic recording and reproduction.
2.7 List five advantages and disadvantages magnetic recording.
2.8 State the principle of optical recording.
2.9 Explain the method of optical recording of sound on film
2.10 Explain the working principle of DVD player.
2.11 Explain working of DVD player with block diagram.
2.12 Define the MP3 & MP4 formats..
2.13 Explain the concept of noise reduction using DOLBY system.
2.14 Explain home theatre sound system.
2.15 Describe the speaker arrangement and features of Dolby Digital 5.1 Surround Sound (AC3)

3.0 Comprehend TV Picture & Composite video signal

3.1 Explain formation of picture.
3.2 State the need for horizontal and vertical scanning.
3.3 State the frame and field frequencies.
3.4 State need for vertical synchronisation, horizontal synchronisation and blanking pulses.
3.5 Mention the frequency allocation of T.V. Channels used in India.
3.6 List all standards of T.V. transmissions as per C.C.I.R.
3.7 List different types of scanning
3.8 Distinguish between progressive and interlaced scanning.
3.9 Draw the standard scanning pattern in an interlaced scanning.
3.10 State the need for interlaced scanning with reference to Bandwidth.
3.11 List all different pulses in a composite video signal.
3.12 State and compare positive and negative modulation.
3.13 Sketch composite video signal as per I.S.I. specification.
3.14 State the need for front porch and back porch in blanking pulses.
3.15 State the necessity of equalising pulses and serrated vertical blanking pulses.

4.0 Understand the working of Colour Television.

4.1 Explain the main characteristic of human eye with regard to perception of colours.

4.2 Distinguish between additive and subtractive mixing of colours.
4.3 Explain complementary colours, hue, saturation, and Colour circle.
4.4 Explain compatibility in TV system.
4.5 List three standards of Colour transmission system like NTSC, PAL and SECAM.
4.6 Explain how chrominance signals are transmitted on one carrier in PAL system.
4.7 Draw the block diagram of a Colour TV transmitter and state the function of each block.
4.8 Draw the block diagram of a Colour TV receiver and state the function of each block.
4.9 Explain the processing of Colour video signal (PAL system) in a Colour receiver.
4.10 List different types of Colour TV monitors.
4.11 Explain basic principles of above technologies

5.0 Understand the principles of Cable, Satellite and Smart TV
5.1 Draw and explain the block diagram of CATV.
5.2 Explain the cable TV components such as amplifiers directional couplers and Converters.
5.3 Explain the necessity of mid-band and super-band channels
5.4 State the need for satellite for TV broadcasting over wide area.
5.5 Explain the merits of DTH system
5.6 With a block diagram explain DVB-S channel reception with block diagram.
5.7 State the need for SET TOP BOX.
5.8 List all features of Projection TV
5.9 List applications of Projection TV
5.10 Explain the features of HDTV
5.11 Explain the features of SMART TV.
5.12 List the important specifications of UHD TV

6.0 Understand the working of Domestic Appliances
6.1 State the working principle of Microwave oven
6.2 Explain functional block diagram of Microwave oven
6.3 List advantages of Microwave oven
6.4 Explain the principle of Induction heater.
6.5 Give the reasons for using only magnetic metals for use with induction heater.
6.6 List the 4 merits of induction heating .
6.7 Explain the functional block diagram of Electronic Washing machine
6.8 List any three advantages of Fuzzy logic in washing machines
6.9 Explain functional block diagram of Camcorder
6.10 List applications of Camcorder

COURSE CONTENTS

1. Introduction to Audio Systems

properties of sound, Hi-Fi and stereo systems, disc recording and reproduction. Magnetic recording and reproduction, optical recording. Working of DVD player, MP3 & MP4 player..

2. TV Picture & Composite Video Signal

Picture elements. Horizontal and vertical scanning, frame and field frequencies, Horizontal and vertical synchronisation, Horizontal and vertical blanking. T.V. Channel standards. Construction of composite Video signal, Horizontal blanking time and vertical blanking time. Linear scanning, standard scanning pattern. Flicker, sync Pulses, blanking signals.

3. Colour Television

Fundamental concepts of 3 colours systems. Additive and subtractive mixing of colours. Different Colour systems like NTSC, PAL, and SECAM. Colour TV Transmitter block diagram. Colour TV receiver block diagram (PAL). Colour video signal processing, operating and service controls,

4. Cable, satellite and digital TV

Cable TV, DTH system, DTH receiver, HD TV – SMART TV – features of UHD TV

5. Domestic Appliances

Microwave oven, Induction Heater-washing Machine, Digital camera – camcorders-

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 - SP Bali, -Pearson
5. Digital Satellite Television Handbook By Mark E. Long

COMPUTER HARDWARE

Subject Title : Computer Hardware

Subject Code : EC-503

Periods /Week : 04

Periods/Semester : 60

Rationale : Computer Hardware subject is included in the V semester as the understanding of computer and its associated hardware is rather a necessity for survival in the present situation. Units are designed to give a clear understanding of Computer Hardware including Operating system. The knowledge of computer hardware makes the students eligible for jobs computer industry also.

TIME SCHEDULE

Sl.	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Mother Board	20	19	3	1
2	Peripherals.	20	36	2	3
3	Windows OS	10	36	2	3
4	PC assembly & Software Installation	10	19	3	1
	Total	60	110	10	8

OBJECTIVES

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

1.0 Understand mother board and its features

1.1 Draw the layout of components in the motherboard.
1.2 List different expansion slots available on the motherboard.
1.3 List all the details of different chipsets in use.
1.4 Explain the processor interface and specifications of processor.
1.5 List all different types of MEMORIESs in use..
1.6 Explain accelerated graphics port.
1.7 Explain power supply connectors and external devices.

1.8 Mention different types of serial, parallel and USB ports.
1.9 Give 4 reasons for popularity of USB ports
1.10 List all the connector details for printer, serial port, mouse, keyboard and USB.

2.0 Comprehend the use of various computer peripherals
2.1 Explain the Working of Hard Disk and data access.
2.2 Explain the storage of data on DVD
2.3 Explain the functioning of GRAPHIC CARD.
2.4 Explain the functioning of Network card and list its specifications.
2.5 List five specifications of monitor.
2.6 Explain the working of LCD monitor.
2.7 Explain the working principle of infrared keyboard and infrared mouse

3.0 Computer Accessories
3.1 List three types of printers.
3.2 Explain the working of dot matrix printer.
3.3 Explain the working of Laser printer.
3.4 Explain the working of inkjet printer.
3.5 Explain the working of scanners.
3.6 Explain OCR (optical character recognition).
3.7 Explain the JPEG and MPEG formats.
3.8 Explain the principle of DVD and Writer.
3.9 List out the features of a LAPTOP
3.10 Differences between DESKTOP and LAPTOP.
3.11 List five features of TABLET(TAB)
3.12 List three features of FABLET
3.13 List out features of TOUCH SCREEN for modern gadgets.

4.0 Understand windows operating systems.
4.1 Define the Power On Self Test (POST).
4.2 Explain the need for BIOS settings.
4.3 Know about the booting procedure.
4.4 Describe the usage of File Allocation Table (FAT).
4.5 Describe the structure and uses of Windows registry
4.6 State the purpose of INI and INF files
4.7 List all device classes in the device manager.
4.8 Explain the purpose of control panel icons
4.9 List all types of viruses and ways of removing viruses.
4.10 List any five Anti-Virus Software available in market

5.0 Understand PC assembly and software installation
5.1 Explain the steps in assembling a PC.
5.2 Explain the editing of CMOS set up and its details.
5.3 Describe the process of formatting.
5.4 State the use FDISK.
5.5 Explain disk manager and disk partitioning
5.6 List the operating systems and their features.

5.7 Explain Installation of WINDOWS OS
5.8 State the uses of Linux OS and ANDROID OS
5.9 State the need for installation of device drivers.
5.10 Explain blocking, damaged sectors, Defragmentation, and Removal of temporary files.
5.11 List different microprocessors (INTEL, MOTORALA) for PC applications

COURSE CONTENTS

1. Motherboard.: Motherboard – component layout, chip set, slots, serial port, parallel port, USB port, connectors. RAM, cache memory, AGP.

2. Peripherals: HDD, FDD, sound card, Video grabber card, network card, Monitor, Keyboard, and mouse. Laptop

3. Accessories: Working and specifications of dot matrix, Laser and inkjet printers-Scanner-JPEG, MPEG-DVD RW-ANTI VIRUS

4. Windows Operating System: Power On Self Test, BIOS, Booting, auto executable batch file, config.sys file, windows registry, Device manager, control panel, viruses.

5. PC assembly and Software Installation: Assembling PC, CMOS set up, Installation OS, Installation of device drivers, system tools.

REFERENCE BOOKS

1. Peter Norton's complete guide to PC upgrades 2nd edition by Peter Norton, Micheal Desmond, PHI
2. Peter Norton's new inside the PC by Peter Norton, Scott Clark, PHI
3. Microprocessors, PC Hardware and interfacing by N. Mathivanan PHI
4. Trouble shooting your PC by M. David Stone and Alfred Poor,PHI
5. Enhanced guide to managing and maintaining your PC-Third Edition,Thomson

OPTICAL FIBER COMMUNICATIONS

Subject Title : Optical Fibre Communications

Subject Code : EC-504
Periods/Week : 04

Periods/Semester : 60

Rationale: Optical fibre communication is introduced as a separate course keeping fast growing trends of communication Engineering in mind and to meet the needs of Internet and Mobile communications industry

TIME SCHEDULE

Sl	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Over View of Fiber Optic Communication	10	16	2	1
2	Fiber Drawing Process and cabling	12	21	2	1 ½
3	Fiber Optic Components	13	26	2	2
4	Fiber Optic Devices	15	31	2	2½
5	WDM and Optical Networks	10	16	2	1
	Total	60	110	10	8

OBJECTIVES

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

1.0 Over View of Fibre Optic Communication
1.1 State the advantages of Light wave communication system over EM wave systems.
1.2 List different optical spectral bands.
1.3 List three generations of optical fibres
1.4 Explain the structure of optical fibre
1.5 Classify optical fibres based on refractive index profile

1.6 List the types of fibres based on core diameter
1.7 Define Single mode fibre (SMF)
1.8 Define multimode fibre (MMF)
1.9 List the advantages of SMFs over MMfs.
1.10 Define Snell's law in optics
1.11 Explain Total internal reflection in optical fibre.
1.12 Define acceptance angle
1.13 Define cone of acceptance.
1.14 Define numerical aperture (NA)
1.15 Derive the expression for NA in terms of core and cladding refractive indices.
1.16 List the advantages of optical fibres over other communication media

2.0 Fibre manufacturing and cabling
2.1 List four types of fibre drawing processes.
2.2 Explain Outside Vapour Phase Oxidation (OVPO)method
2.3 Explain Vapour phase Axial Deposition (VAD) method
2.4 Explain Modified Chemical Vapour Deposition (MCVD) method
2.5 Explain Plasma activated Chemical Vapour Deposition (PCVD) method.
2.6 List different structural elements used for cable design.
2.7 List two types of fibre optic cables.
2.8 Describe the characteristics of loose buffered cable
2.9 Describe the characteristics of tight buffered cable
2.10 List various losses in optical fibres.
2.11 Explain intrinsic and extrinsic losses
2.12 Classify different types of dispersions occur in optical fibres.
2.13 Explain Group velocity dispersion
2.14 Distinguish between inter modal and intra modal dispersion.
2.15 Define wave guide dispersion
2.16 Briefly explain Polarization mode dispersion

3.0 Fibre Optic components and measuring instruments
3.1 List various fibre optic components
3.2 State the need for connectors in FOC
3.3 State the function of splice in optical fibres
3.4 List two types of connectors.
3.5 List two types of splices.
3.6 Distinguish between mechanical splice and fusion splice
3.7 Predict different losses occur due to improper splicing
3.8 State the need for optical coupler/splitter
3.9 List different optical couplers
3.10 Explain the working of an optical coupler
3.11 State the need for isolator in OFC
3.12 Explain the working of isolator.
3.13 List different types of measuring/testing instruments used in the field of OFC.
3.14 Describe the use of optical power meters
3.15 State the use of optical attenuators
3.16 Explain the working of Optical Time Domain Reflectometer (OTDR).

4.0 Fibre Optic Devices

4.1 List two types of sources used in OFC
4.2 Define salient features of an optical source
4.3 List two types of detectors used in OFC
4.4 Define salient feature of an optical detector
4.5 Explain the construction and working of an LED
4.6 State the principle of LASER.
4.7 Explain the construction and working of LASER source.
4.8 List the differences between LED and LASER sources
4.9 Explain the construction and working of PIN photo diode.
4.10 Explain the construction and working of APD (Reach through APD)
4.11 State the need for repeater/regenerator in FOC
4.12 List three types of repeaters
4.13 Differentiate R, 2R and 3R repeaters.
4.14 Distinguish between repeaters and optical amplifiers.
4.15 Draw the block diagram of Erbium Doped Fibre Amplifier (EDFA).
4.16 Explain the principle and operation of EDFA
4.17 Draw the block diagram of fibre optic communication system and explain each block.
4.18 List the other applications of LED and LASER

5.0 Wavelength Division Multiplexing & Optical Networks

5.1 Define optical time domain multiplexing
5.2 Limitations of time division multiplexing (OTDM) in FOC
5.3 Define wavelength division multiplexing.
5.4 Explain the need for WDM in fibre optic communication
5.5 List two types of WDM systems
5.6 Distinguish between wideband WDM and narrowband WDM (DWDM)
5.7 Draw the block diagram of WDM system
5.8 Draw and explain the block diagram of DWDM
5.9 List three types of network topologies
5.10 Briefly explain bus, ring and star topologies used in fibre optic networks.
5.11 State the use of fibre optic cables in local area networks.
5.12 Describe use of fibres in Ethernet and Gigabit Ethernet.
5.13 Explain the use of fibre optic cables as submarine cables.
5.14 Explain the use of fibres in local telephone and cable T.V (FTTH)

COURSE CONTENTS

1. Over View of Fibre Optic communication

Motivation-optical spectral bands-generations of optical fibers-structure of fiber-classification of fibers-Single mode fibers-multimode fibers-total internal reflection-acceptance angle-cone of acceptance-numerical aperture-advantages of fibers

2. Fiber manufacturing and cabling

Types of fiber drawing processes-outside vapor phase oxidation method-vapor phase axial deposition (VAD)-modified chemical vapor deposition (MCVD)-Plasma activated Chemical Vapor Deposition (PCVD)-cable design-types of fiber optic cables-losses in optical fibers-types of dispersions.

3. Fiber Optic components and measuring instruments

Connectors-splices-optical couples/splitters-isolator-optical power meters-optical attenuators-optical time domain reflectometer (OTDR)

4. Fiber Optic Devices

LED-LASER-PIN diode-APD-repeaters-optical amplifiers-Erbium Doped Fiber Amplifier (EDFA)-.block diagram of fiber optic communication system

5. Wavelength Division Multiplexing & Optical Networks

OTDM- wavelength division multiplexing-types of WDM-block diagram of DWDM-network topologies-applications-Ethernet-gigabit Ethernet-FTTH

Reference Books

1. Optical Fiber Communications by Gerd Keiser McGraw Hill
2. Optical fiber and Laser- Principles and applications by Anuradha De, New Age publications
3. Optical fiber communications-Principles and practice, John M. Senior, Pearson Publications
4. Optical Fiber Communications and Its Applications – S.C.Gupta, 2004, PHI.

MICRO CONTROLLER APPLICATIONS

SUBJECT TITLE : MICRO CONTROLLER APPLICATIONS

SUBJECT CODE : EC- 505

PERIODS/WEEK : 04

PERIODS/SEMESTER : 60

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	Hardware Interface	10	16	2	1
2	Interfacing External Memory	15	26	2	2
3	Interfacing 8255 PPI	15	26	2	2
4	Interfacing with RTC	10	26	2	2
5	Control Applications	10	16	2	1
	Total	**60**	**110**	**10**	**8**

OBJECTIVES

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

6.0 HARDWARE INTERFACING

6.1 Explain hardware interfacing of ADC chip.
6.2 Explain Interfacing temperature sensors to 8051
6.3 Explain the process of data acquisition using ADC chips
6.4 Explain the choice of selecting ADC chip
6.5 Explain the function of 8047/809/848/ ADC chips
6.6 Describe the function of chips MAC 1112 ADC chip
6.7 Explain Interfacing serial ADC chip to 8051
6.8 Program serial and parallel chips in 8051 in ' C' and assembly
6.9 Describe the basic operation of DAC chip with 8051.
6.10 Explain the function of precision IC temperature sensors
6.11 Describe the signal conditioning and its role in data acquisition

7.0 INTERFACING EXTERNAL MEMORY

7.1 Explain semiconductor memories with respect to memory capacity and organisation
7.2 Explain the features of EPROM
7.3 List any 6 popular UV EPROM chips and explain the pin configuration of any one
7.4 List other memory types flash memory, mask RAM, RAM, SRAM, NVRAM, DRAM, checksum byte ROM, DRAM
7.5 Explain memory address decoding 740LS138 3 X 8 decoder
7.6 Explain interfacing with external ROM
7.7 Explain data memory space of 8051 and accessing
7.8 Explain interfacing of large external memory (256KB)

8.0 INTERFACING 8255 PPI chip

8.1 Describe expansion of I/O ports using 8255
8.2 List 3 ports of 8255 and describe their features
8.3 Explain the use of control register in selecting a mode
8.4 Define modes of 8255
8.5 Define the term memory mapped I/O and describe its application
8.6 Program 8255 as simple i/o port for connection with LCD and ADC
8.7 Interface 8051 with external devices such as stepper motor using 8255
8.8 Program 8255 in simple I/O mode using 'C' language

9.0 Interfacing with RTC

9.1 Interfacing DS12887 RTC with 8051
9.2 Explain how RTC chip works
9.3 Explain the function of DS12887 pins
9.4 Explain the function of registers
9.5 Understand the interfacing of DS12887 RTC to 8051

9.6 Writ e a program in C to access RTC registers
9.7 Write a program to display time and date in assembly and C
9.8 Understand interrupt and alarm features DS12887
9.9 Explore and program the alarm and interrupt features of RTC DS12887

10.0 CONTROL APPLICATIONS AND 8051 FAMILIES (FLASH VERSIONS)
10.1 Explain the need of relays and opto couplers for interfacing
10.2 Interface 8051 with relay to drive a lamp
10.3 Interface a solid state relay to drive a mains operated motor
10.4 Interface a stepper motor
10.5 Write a program to run stepper motor continuously
10.6 Describe the controlling of stepper motor using opto isolator and write a program in C
10.7 Explain pulse width modulation for controlling the speed of small DC motor.
10.8 Draw the interfacing circuit for Control of a small DC motor using Darlington and MOSFET
10.9 Write a program in C for PWM speed Control of a small DC motor.
10.10 Explain applications like traffic control, temperature controller

COURSE CONTENT

HARDWARE INTERFACING
hardware interfacing -temperature sensors-process of data acquisition-selecting ADC chip-8047/809/848/ ADC chips -MAC 1112 ADC chip-‘ C’ and assembly -DAC chip with 8051.-IC temperature sensors-Signal conditioning

INTERFACING EXTERNAL MEMORY
semiconductor memories -memory capacity and organization – EPROM - UV EPROM chips - flash memory, mask RAM, RAM, SRAM, NVRAM, DRAM, checksum byte ROM, DRAM - memory address decoding-interfacing external ROM-memory space of 8051 and accessing-interfacing of large external memory (256KB)

INTERFACING 8255 PPI chip
Expansion of I/O ports using 8255 -Ports of 8255-features-control register-modes of 8255-memory mapped I/O-connection with LCD and ADC-Interface 8051 with external devices-stepper motor

Interfacing with RTC
Interfacing DS12887 RTC with 8051-RTC chip working-function of DS12887 pins-program in C to access RTC registers-display time and date in assembly and C-interrupt and alarm features DS12887-

8051 Applications

Interfacing Relays and opto couplers - Driving a lamp with relay –Interfacing a solid state relay –Interfacing a stepper motor- running motor continuously -controlling of stepper motor using opto isolator in C-PWM control of speed-interfacing DC motor-traffic control- pump & lift controller-Temperature controller

REFERENCE BOOKS:

7. 8051 Micro controller by Mazidi and Mazidi.
8. 8051 Micro controller by Kenneth J.Ayala.
9. Programming customizing the 8051 Microcontroller by Myke Predko TMH
10. Microcontrollers (theory and applications) by Ajay V Deshmukh

DATA COMMUNICATIONS AND COMPUTER NETWORKS

Subject Title : Data Communications Computer Networks

Subject Code : EC-506

Periods/Week 04

Periods/Semester : 60

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	10	21	2	1 ½
2	Concepts of LAN & DLL Protocols	16	26	2	2
3	IP addressing & Network Layer Protocols	12	21	2	1 ½
4	WAN Protocols	10	21	2	1 ½
5	Web Applications & Network Security	12	21	2	1 ½
	Total	60	110	10	8

OBJECTIVES

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

1.0 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 Define virtual circuit and datagram approaches 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 and explain its frame format (IEEE 802.11).
2.14 Discuss FDDI and its properties.
2.15 Explain the Bluetooth technology.
2.16 Write 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 Describe 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 Write the packet transfer mechanism using routers and IP address.
3.11 Explain the internal architecture of ISP.

3.12 Know about Dial up access, leased line, DSL, ISDN types of internet connectivity for an individual user/ organization.

4.0 WAN protocols

4.1 Know about WAN architecture.
4.2 List the three commonly used WAN technologies.
4.3 Describe the working of X.25 WAN Protocol
4.4 Describe the FRAME relay WAN Protocol.
4.5 Explain ATM WAN Protocol.
4.6 Describe 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 Write the functions of port and sockets.
4.11 Describe the features of UDP
4.12 Explain the connectivity of systems using TCP & UDP
4.13 Describe the use of Gateways.

5.0 Understand Web Applications & Network security.

5.1 Write the role of DNS server.
5.2 Explain DNS namespace.
5.3 Explain how email is transferred.
5.4 Discuss 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 Describe 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

COURSE CONTENTS

1.0 Basics of Data communication & OSI Layer

Introduction-concepts of data communication- analog and digital data-computer network-OSI 7 Layered architecture-UTP- STP- Coaxial and Fiber optic cable - simplex, half-duplex and full-duplex communication-bandwidth and throughput-circuit switching-packet switching-message switching

2.0 Understand the concepts of LAN and DLL protocols

Local area network-network topologies (Bus, Star, Ring)-Token ring network-Hub/Repeaters-bridges-routers-need for protocols-Ethernet frame format (IEEE 802.3)- flow control-error control-simplest protocol - stop-and-wait protocol-stop-and-wait ARQ-Go-back-N ARQ protocols-PPP-CSMA/CD-CSMA/CA-wireless LAN frame format (IEEE 802.11)-FDDI-Bluetooth-WAP.

3.0 Understand IP addressing and Network layer protocols

Internet and Intranet- Internet protocol-connection oriented (virtual circuit) and connectionless (datagram) services-IPv4 addressing-classful and classless addressing-IPv6 addressing-router and routing-cut through & store-and-forward protocols-packet transfer mechanism using routers and IP address-architecture of ISP-PSTN Internet connectivity: Dial up access-leased line-DSL-ISDN

4.0 WAN protocols

WAN architecture-X.25, FRAME relay and ATM WAN Protocols- ARPA NET and WWW-TCP/IP-Address Resolution Protocol- port and sockets-UDP- gateways

5.0 Understand Web Applications & Network security.

DNS server- email transfer-POP server-SMTP server-FTP- Web server-Web browser- HTTP commands-proxy server- hyperlinks-web browser architecture-remote login-network security-security services.

Reference Books:

1. Network communication Technology by Ata Elahi Thomson
2. Data Communication and Networking by Godbole TMH
3. Data and Computer Communications: William Stallings 7th edition. PHI
4. Data Communication and Networking: Behrouz Forouzan 3rd edition.TMH

COMPUTER HARDWARE & NETWORKING PRACTICE

Subject Title : Computer Hardware & Networking Lab Practice .

Subject Code : EC-507
Periods/Week : 04
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.	COMPUTER SYSTEM(DESKTOP,LAPTOP)	
2.	COMPUTER PERIPHERALS	
3.	NETWORKING	
4	FIBRE OPTICS	
	Total	45

List of Experiments

1.0 PC Hardware- Identification of System Layout.

1. To Identify Basic Computer Hardware and Cables
2. To Identify and note down mother board , Components and Chips
3. To Identify various Internal and External slots in the mother board and clean them with blower/ Brush.
4. To Practice Inserting and Removing RAM with care
5. To measure the Output voltages of SMPS
6. To disassemble the PC
7. To assemble the PC and test
8. To change CMOS Setup
9. To Install Operating system Windows and Linux
10. To Verify the function of control panel settings.
11. To Partition and format Hard disks.
12. To Install system and application software
    a) To install & Run antivirus software
13. To Carry out Preventive maintenance of a PC
14. To take Backup of C drive
15. To identify Laptop Hardware
16. To carry out PC Troubleshooting

2.0 Printers , Scanners, Cameras

17. To connect , operate and maintain i) Inkjet Printer ii) Laser Printer iii)Scanner iv) Web Cam

3. Computer Networking

18. To identify and note down the specifications of various networking devices & Cables, Jacks , Connectors, tools etc used in local area networks
    a) To Prepare the UTP cable for cross and direct connections using crimping tool.
19. To Transfer files between systems in LAN using FTP Configuration,
    a) To install i Print server in a LAN and share the printer in a network
20. To Test the Network using ipconfig, ping / tracert and Netstat utilities and debug the network issues (3)
21. To Install and configure Network Devices: HUB ii) Switch iii) Routers

22. To Configure Host IP, Subnet Mask and Default Gateway in a system in LAN (TCP/IP Configuration).
    a) To Configure DNS to establish interconnection between systems

23. To Transfer files between systems in LAN using FTP Configuration,
    a) To install Print server in a LAN and share the printer in a network

24. To Install and Configure Wireless NIC and transfer files between systems in LAN and Wireless LAN
25. To access a remote desktop using Team viewer software
    a) To store the files in Cloud using Google drive/One drive/Drop box & share

26. To Explore the features of Windows 2000 server

4.0 Fiber Optics

27. To Set up fiber optic analogue link.
    a)To Set up a fiber optic digital link

28. To verify modulation & Demodulation of light source by pulse width modulation technique.
29. To Test Fiber optic Voice Link.
30. To Verify the NRZ & RZ modulation formats in Optical Communication.

Competencies and Key Competencies to be achieved

Exp No	Name of the Experiment	Competencies	Key Competencies
1	To Identify Basic Computer Hardware and Cables	Identify ➢ Key board , Mouse, Webcam ➢ Front panel indicators switches ➢ Front side & rear side connectors. Ports ➢ Mark positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards. ➢ Power cable, VGA cable, Audio cable	➢ Configure bios setup program and troubleshoot the typical problems using BIOS utility.

2	To Identify and note down mother board , Components and Chips	**Mother Board** ➢ Note the layout of I5/I3/Pentium IV or Pentium Dual core or Pentium Core2 DUO mother board and mark Processor, ➢ Identify Chip set ICs. RAM, Cache, Xtal, CMOS Battery ➢ Identify CPU cooling fan, I/O slots and I/O ports and various jumper settings. ➢ ATX Power connector ➢ CPU (Central Processing Unit) socket	➢ Note the layout of I5/I3/Pentium IV or Pentium Dual core or Pentium Core2 DUO mother board and mark Processor, ➢ Identify Chip set ICs. RAM, Cache, Xtal, CMOS Battery ➢ Identify CPU cooling fan, I/O slots and I/O ports and various jumper settings. ➢ ATX Power connector ➢ CPU (Central Processing Unit) socket
3	To Identify various Internal and External slots in the mother board and clean them with blower/ Brush.	Internal : Identify ➢ PCI Express 16x slots PCI Express 1x Slot ➢ DIMM (Double Inline Memory Module) slots ➢ Serial ATA Connector south Bridge ➢ IDE connector ➢ PCI (Peripheral Component Interconnect) slot ➢ *BIOS (Basic Input Output System) Chip* *External :* Identify ➢ Bus) PortsPS/2 Connectors - USB (Universal Serial - Parallel Port -Game Port ➢ Sound card Connectors ➢ Display VGA Connector	➢ PCI Express 16x slots PCI Express 1x Slot ➢ DIMM (Double Inline Memory Module) slots ➢ Serial ATA Connector south Bridge ➢ IDE connector ➢ PCI (Peripheral Component Interconnect) slot ➢ *BIOS (Basic Input Output System) Chip* *External :*Identify ➢ Bus) PortsPS/2 Connectors - USB (Universal Serial - Parallel Port - Game Port ➢ Sound card Connectors ➢ Display VGA Connector ➢ COM

		➢ COM (communications) Port	(communications) Port
4	To Practice Inserting and Removing RAM with care	➢ Identify the RAM type SRAM ,DDR ,DDR2 DDR3 by observing the notch ➢ Place DIMM with correct orientation ➢ Insert with correct force till it is locked ➢ Test by slightly pulling ➢ Remove DIMM by opening latches on either side	➢ Identify the RAM type SRAM ,DDR ,DDR2 DDR3 by observing the notch ➢ Place DIMM with correct orientation ➢ Insert with correct force till it is locked ➢ Test by slightly pulling Remove DIMM by opening latches on either side
5	To measure the Output voltages of SMPS	➢ Remove the SMPS ➢ Identify the ground Short the enable pin to ground Measure the output voltages with DMM	➢ Identify the ground Short the enable pin to ground ➢ Measure the output voltages with DMM
6	To disassemble the PC	➢ Remove ➢ Power cable ,USB, Firewire, Mouse, Keyboard Internet, Ethernet ,Modem cables ➢ Remove ➢ the rear cabinet screws ,side panel ➢ Remove Mother board power cable & Other cables ➢ Remove SMPS, CD/DVD drive, HDD ➢ Remove mother Board	➢ Remove Power cable, USB, Firewire, Mouse, Keyboard Internet, Ethernet ,Modem cables ➢ Remove ➢ the rear cabinet screws ,side panel ➢ Remove Mother board power cable & Other cables ➢ Remove SMPS, CD/DVD drive, HDD ➢ Remove mother Board
7	To assemble the PC and test	➢ Install PSU DVD ➢ Mother Board Processor heat sink &Fan memory – ➢ Connect HDD ➢ Clear CMOS by	➢ Install PSU DVD ➢ Mother Board Processor heat sink &Fan memory ➢ HDD ➢ Clear CMOS by

		removing jumper ➢ Connect power connector, CPU power connector and other connector ➢ Connect case fan to mother board ➢ Connect sata cables ➢ Test connections ➢ Fix side panels	removing jumper ➢ Connect power connector, CPU power connector and other connector ➢ Connect case fan to mother board ➢ Connect sata cables ➢ Test connections Fix side panels
8	To change CMOS Setup	➢ Identify manufacturer ➢ Open ***cmos*** setup ➢ Change the boot sequence ➢ Enable disable devices/Ports ➢ set pass word change Date/Time ➢ Explore other features	➢ Identify manufacturer ➢ Open cmos setup ➢ Change boot sequence ➢ Enable disable devices/Ports ➢ set pass word change Date/Time ➢ Explore other features
9	To Install Operating system Windows and Linux	➢ Install OS using CD ➢ Set up Disk partitioning ➢ Install drivers	➢ Install OS using CD ➢ Set up Disk partitioning ➢ Install drivers
10	To Verify the function of control panel settings.	➢ To verify and Explore control panel features ➢ System & Security Network& Internet ➢ Hardware & Sound ➢ Programs ➢ User Accounts ➢ Appearance ➢ Clock ➢ Access device manager and check the status ➢ Add or remove hardware devices	➢ To verify and Explore control panel features ➢ System & Security Network& Internet ➢ Hardware & Sound ➢ Programs ➢ User Accounts ➢ Appearance ➢ Clock ➢ Access device manager and check the status ➢ Add or remove hardware devices
11	To Partition and format Hard	➢ Identify HDD Type IDE/SATA	➢ Identify HDD Type IDE/SATA

	disks.	➢ Follow respective procedures ➢ Select NTFS/FAT32 ➢ Backup file ➢ Use Windows/ Startup CD ➢ Use Disk manger	➢ Follow respective procedures ➢ Select NTFS/FAT32 ➢ Backup file ➢ Use Windows/ Startup CD ➢ Use Disk manger
12	To Install system and application software a) To install & Run antivirus software	➢ Access control panel ➢ Install/Uninstall the program ➢ Install antivirus through auto run option ➢ Explore the antivirus settings	➢ Access control panel ➢ Install/Uninstall the program ➢ Install antivirus through auto run option ➢ Explore the antivirus settings
13	To Carry out Preventive maintenance of a PC	➢ Clean C ➢ Scan with antivirus ➢ Run Registry clean utility ➢ Run Defragmentation	➢ Clean C ➢ Scan with antivirus ➢ Run Registry clean utility ➢ Run Defragmentation
14	To take Backup of C drive	➢ Take Backup of C Drive using Backup utility	➢ Take Backup of C drive using Backup utility
15	To identify Laptop Hardware	➢ Identify the Parts of a Laptop - CPU, Display- HDD, DVD drive - USB Ports HDMI-VGA-Ethernet-SDCard	➢ Identify the Parts of a Laptop - CPU, Display- HDD, DVD drive - USB Ports HDMI-VGA-Ethernet-SD Card
16	To carry out PC Troubleshooting	➢ Identify the fault type ➢ Hardware/ software ➢ Run antivirus and other utilities ➢ Run in safe mode ➢ Rectify the problem **Hardware faults** ➢ Faulty cables ➢ Dust accumulation ➢ Monitor problems ➢ Memory problems	➢ Identify the fault type Hardware/ software ➢ Run antivirus and other utilities ➢ Run in safe mode ➢ Rectify the problem **Hardware faults** ➢ Faulty cables ➢ Dust accumulation

		➢ SMPS problems ➢ HDD/CD/ problems ➢ Troubleshoot &Rectify	➢ Monitor problems ➢ Memory problems ➢ SMPS problems ➢ HDD/CD/ problems ➢ Troubleshoot &Rectify
17	To connect , Operate and maintain i) Inkjet Printer ii) Laser Printer iii)Scanner iv) Webcam	➢ Connect and operate Printers ➢ Remove paper jams Load ink Cartridge ➢ Connect to network ➢ Use scanner ➢ Use webcam	➢ Connect and operate Printers ➢ Remove paper jams Load ink Cartridge ➢ Connect to ➢ Network ➢ Use scanner ➢ Use webcam
18	**To identify and note down the specifications of various networking devices & Cables, Jacks , Connectors, tools etc used in local area networks** **a) To Prepare the UTP cable for cross and direct connections using crimping tool.**	➢ Identify & note down the configurations of Network devices ➢ Identify & Select Network cable ➢ Select crimping tool Select the cable ➢ Decide the connection type ➢ Identify the wires as per colour code ➢ Arrange the wires ➢ Cut & Crimp ➢ Test the connection using Ping command	➢ Identify & note down the configurations of Network devices ➢ Identify & Select Network cable ➢ Select crimping tool ➢ Select the cable ➢ Decide the connection type ➢ Identify the wires as per colour code ➢ Arrange the wires ➢ Cut & Crimp ➢ Test the connection
19	**To Transfer files between systems in LAN using FTP Configuration,** a) To install i Print server in a LAN and share the printer in a network	➢ Transfer files between systems in LAN using FTP Configuration, ➢ install Print server in a LAN and share the printer in a network	➢ Transfer files between systems in LAN using FTP Configuration, ➢ install Print server in a LAN and share the printer in a network

20	**To Test the Network using (3)** ***ipconfig, ping / tracert*** and Netstat utilities and debug the network issues	➢ Use the Utilities like ***ipconfig, ping / tracert*** ➢ Identify the issue ➢ Resolve the problem	➢ Use the Utilities like ***ipconfig, ping / tracert*** ➢ Identify the issue ➢ Resolve the problem
21	**To Connect systems in a (3) network using switch.** **a) Install and configure Network Devices:** **i) HUB** **ii) Switch** **iii) Routers**	➢ Select the device ➢ Connect them ➢ Install using Driver software ➢ Set password & ➢ Configure	➢ Select the device ➢ Connect them ➢ Install using Driver software ➢ Set password & ➢ Configure
22	To Configure Host IP, Subnet Mask and Default Gateway in a system in LAN (TCP/IP Configuration). b) To Configure DNS to establish interconnection between systems	➢ Configure Host IP, Subnet Mask ➢ Configure DNS server	➢ Configure Host IP, Subnet Mask ➢ Configure DNS server
23	To Transfer files between (3) systems in LAN using FTP Configuration, b) install Print server in a LAN and share the printer in a network	➢ Open control panel ➢ Access IIS ➢ Set up FTP and Test ➢ Share the printer	➢ Open control panel ➢ Access IIS ➢ Set up FTP and Test ➢ Share the printer
24	**To Install and Configure (3) Wireless NIC and transfer files between systems in LAN**	➢ Install wireless NIC ➢ Configure ➢ Set pass word ➢ Test	➢ Install wireless NIC ➢ Configure ➢ Set pass word

	and Wireless LAN		Test
25	**To access a remote desktop using *Team viewer* software** **b) To store the files in Cloud using Google drive/One drive/Drop box & share (3)**	➢ Install ***Team viewer*** *software* ➢ *Start the session* ➢ *Access desktop remotely* ➢ *Video chat* ➢ *Close the session* ➢ *Use* Google drive /One drive/Drop box & share	➢ Install ***Team viewer*** *software* ➢ *Start the session* ➢ *Access desktop remotely* ➢ *Video chat* ➢ *Close the session* ➢ *Use* Google drive /One drive/Drop box & share
26	**To Explore the features of Windows 2000 server(3)**	➢ Use administrative tools ➢ Configure server for Network connectivity ➢ Sharing a folder ➢ Accessing a folder from my network places on Desktop ➢ Stopping a shared folder ➢ Determine local host address	➢ Use administrative tools ➢ Configure server for Network connectivity ➢ Sharing a folder ➢ Accessing a folder from my network places on Desktop ➢ Stopping a shared folder ➢ Determine local host address
27	To Set up fibre optic analogue link. a)To Set up a fibre optic digital link (3)	➢ Identify the Demonstration board, Fiber optic link & Connectors ➢ Make connections ➢ Test and observe the signal on CRO	➢ Make connections Test and observe the signal on CRO
28	To verify modulation & Demodulation of light source by pulse width modulation	➢ Identify the Demonstration board ➢ Fiber optic link &	➢ Make connections Test and observe the signal on CRO

	technique. (3)	Connectors Make connections Test and observe the signal on CRO	
29	To Test Fibre optic Voice Link. (3)	➢ Identify the Transmitter & Receiver boards,Fiber optic link & Connectors, Microphone ➢ Make connections ➢ Test and listen to the voice signal ➢ Observe any distortion	➢ Make connections ➢ Test and listen to the voice signal ➢ Observe any distortion
30	To Verify the NRZ & RZ modulation formats in Optical Communication.(3)	➢ Identify the Demonstration board Fiber optic link & Connectors ➢ Make connections ➢ Apply digital signal ➢ Test and observe the signal on CRO	➢ Make connections ➢ Apply digital signal ➢ Test and observe the signal on CRO

LIFE SKILLS

Subject Title : Life skills
Subject Code : EC 508 (Common)

Periods per week : 03

Period per semester : 45

TIME SCHEDULE

Sl No.	Major Topics	No. of periods		
		Theory	Practical	Total
1.	Concept of life skills	03	00	03
2.	Enhancing self esteem	01	02	03
3.	Goal setting	01	02	03
4.	Positive attitude	01	02	03
5.	Managing emotions	1 1/2	4 1/2	06
6.	Stress management	1 1/2	4 1/2	06
7.	Time management	1/2	2 1/2	03
8.	Interpersonal skills	01	02	03
9.	Creativity	01	02	03
10.	Problem solving and Decision making skills	01	02	03
11.	Assertiveness	1 1/2	4 1/2	06
12.	Leadership skills &Team spirit	1 1/2	1 1/2	03
TOTAL		15 1/2	29 1/2	45

Note: No Written Examination

The students may be asked to Demonstrate 1 or 2 skills from unit 2 to unit 12.

Marks: Internal – 40; External - 60

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

1.0 Understand the concept of life skills

1.1 Define Life skills

1.2 Explain need and impact of Life skills programme

1.3 List the elements of Life skills

1.4 Identify the sources of Life skills

2.0 Understand the concept of Self esteem

2.1 Define the term self esteem

2.2 Explain the concept of self esteem

2.3 List the characteristics of High self esteem

2.4 List the characteristics of Low self esteem

2.5 Explain the advantages of High self esteem

2.6 Explain the behavior patterns of low self esteem

2.7 Explain the causes of Low self esteem

2.8 List the steps to build a positive self esteem

Practicals

Exp No	**Exercise**	**Activity (**Questionnaire / Game and Role play)
1.	Identifying the Behavior	• Identifying the behavior patterns of low self-esteem people.
2.	Practice Positive Self Esteem	• Steps to build a positive self esteem

3.0 Understand the concept of Goal setting

3.1 Define the term Goal

3.2 Explain the significance of Goal setting

3.3 Explain the following concepts

a) Wish b) Dream c) Goal

3.4 Explain the reasons for not setting goals

3.5 Explain the effective goal setting process

3.6 List the barriers to reach goals

Practicals

Exp No	Exercise	Activity
1	Differentiate among Wish, Dream and Goal	• Drawing a picture of Your Self/ Your Country/ Your Society after 10yrs. • Discussion: Setting Personal Goals • Story Telling • Identifying of barriers • Analysis of barriers • Overcoming Barriers

4.0 Practice positive attitude

4.1 Define Attitude

4.2 Explain the concept of positive attitude

4.3 Explain the concept of negative attitude

4.4 Explain the affects of negative attitude

4.4 Identify the attitude of self and peers

4.5 Explain the effect of peers on self and vice-versa.

4.6 List the steps to enhance positive attitude

4.7 Explain the strategies to enhance positive attitude

Practicals

Exp No	**Exercise**	**Activity** (Psychological Instrument/ Game & Role play**)**
1.	Identify Positive attitude	• To study & to identify the attitude of self and peers. • List & practice the strategies to enhance positive attitude.
2	Observe	• Positive attitudes of self and Peers • Negative attitudes of self and Peers
3	Practice Strategies to enhance Positive attitude	• Celebrating the success • Listing the successes

5.0 Practice managing emotions

5.1 Explain the concept of emotion

5.2 List the different types of emotions

5.3 Differentiate between positive and negative emotions

5.4 Identify the type of emotion

5.5 Explain the causes of different types of emotions.

5.6 Implement the methods to manage major emotions (anger / depression)

5.7 Define Emotional Intelligence.

5.8 Explain the method to enhance emotional Intelligence.

Practicals

Exp No	**Exercise**	**Activity** (Story / simulated situational act /GD & Role play)

1.	Identify the Type of Emotion	• To identify the type and to study the cause of the emotion.
2	Managing Emotions	• Managing major emotions -Anger and Depression

6.0 Practice stress management skills

6.1 Define Stress

6.2 Explain the concept of stress

6.3 List the Types of stress

6.4 Explain the causes of stress

6.5 Comprehend the reactions of stress

a) Physical b) Cognitive c) Emotional d) Behavioral

6.6 Explain the steps involved in coping with the stress by

a) Relaxation b) Meditation c) Yoga

6.7 Practice the stress relaxing techniques by the 3 methods.

a) Relaxation b) Meditation c) Yoga

6.8 Comprehend the changing personality and cognitive patterns.

6.9 Observe the changing personality and cognitive patterns.

Practicals

Exp No	**Exercise**	**Activity**(Questionnaire /Interview and practice)
1	Identify the type of stress	• To study & to identify the type and causes of stress.
2	Stress –Relaxation Techniques	• Practice some simple Stress –Relaxation Techniques, Meditation, Yoga.

7.0 Practice Time management skills

7.1 Define Time management.

7.2 Comprehend the significance of Time management.

7.3 Explain the strategies to set priorities.

7.4 List the steps to overcome barriers to effective Time management.

7.5 Identify the various Time stealers.

7.6 Explain the Time-Management skills.

7.7 List different Time-Management skills.

7.8 Comprehend the advantages of Time-Management skills.

Practicals

Exp No	**Exercise**	**Activity** (Group work and Games)
1	Identify Time stealers	• Assign a activity to different Groups –Observe the time of accomplishing the task, Identify the time stealers.
2.	Practice Time-Management skills	• Perform the given tasks- Games

8.0 Practice Interpersonal skills

8.1 Explain the significance of Interpersonal skills.

8.2 List the factors that prevent building and maintaining positive relationships.

8.3 Advantages of positive relationships.

8.4 Disadvantages of negative relationships

Practicals

Exp No	**Exercise**	**Activity**
1	Identify Relationships	• Positive Relationships, Negative Relationships – Factors that affect them- Through a story

2.	Practice Rapport building	• Exercises on Rapport building • Developing Correct Body Language

9.0 Understand Creativity skills

9.1 Define Creativity

9.2 List the synonyms like Invention , Innovatioin, Novelty

9.3 Distinguish between Creativity , Invention, innovation, and novelty

9.4 Discuss the factors that lead to creative thinking like observation and imitation , improvement etc.

9.5 Distinguish between Convergent thinking and divergent Thinking

9.6 Explain various steps involved in Scientific approach to creative thinking namely a) Idea generation b) Curiosity c) Imagination d)Elaboration e) Complexity

f). Abstract ion and simplification g). Divergent Thinking h) Fluency i). Flexibilty

j).Persistance k).Intrinsic Motivation l).Risk taking m).Projection/empathy

n).Originality o). Story telling p). Flow.

List the Factors affecting the creativity in Individuals.

9.7 Give the concept of Vertical thinking and lateral thinking.

9.8 Explain the importance of Lateral thinking.

9.9 Compare lateral thinking and Vertical thinking

Practicals

Exp No	**Exercise**	**Activity** (Games and Group work)
1	Observe any given object	• Identifying finer details in an object
2.	Imagine	• Imagining a scene • Modifying a story (introduce a twist) • Improving a product • Finding different uses for a product

3	Skills	• Making paper craft
4	Product development	• Brain storming session
5	Developing originality	• Come up with original solutions for a given problem

10.0 Understand Problem solving and decision making skills

10.1 Define a Problem

10.2 Analyze the performance problems

10.3 Categorize the problems

10.4 List the barriers to the solutions to problems.

Practicals

Exp No	**Exercise**	**Activity** (Brainstorming – checklist technique free association, attribute listing)
1	Gather the facts and Data and Organizing the information.	• Information gathering and organizing • Identifying the solutions to the problem • Identifying the barriers to the solutions • Zeroing on Optimum solution
2.	Problem solving	• Games on Problem solving

11.0 Understand Assertive and non Assertive behavior

11.1 List the 3 types of Behaviors 1. Assertive 2. Non assertive (passive) 3. Aggressive Behaviour 4.Submissive behaiviors
11.2 Discuss the personality of a person having above behaviours
11.3 Explain the usefulness of assertive behavior in practical situations.
11.4 Explain the role of effective communication in reflecting assertive attitude
11.5 Give examples of Assertive statements a) Assertive request b) assertive NO
11.6 Explain the importance of goal setting
11.7 Explain the method of Conflict resolution.
11.8 Discuss the methods of controlling fear and coping up with criticism.

Practicals

Exp No	**Exercise**	**Activity** (Simulated situational act)
1	Observation of behavior	• Identifying different personality traits from the body language
2.	Practicing assertiveness	• Write statements • Reaction of individuals in a tricky situation • Facing a Mock interview • Detailing the characteristics of peers • setting goals – Games like throwing a coin in a circle • Giving a feedback on a)Successful program b) Failed project • Self disclosure
3	Skills	• Dealing with a critic • Saying NO • Dealing with an aggressive person
4	Simulation	• Role play- skit 1. Assertive statements 2. goal setting 3. self disclosure

12.0 Practice Leadership skills

12.1 Explain the concept of leadership

12.2 List the Traits of effective leader

12.3 Distinguish between Managing and leading

12.4 List the 3 leadership styles

12.5 Compare the above styles of leadership styles

12.6 Discuss choice of leadership style

12.7 Explain the strategies to develop effective leadership.

12.8 Explain the importance of Decision making

12.9 Explain the procedure for making effective decisions.

Practicals

Competencies for Practical Exercises

Exp No	**Exercise**	**Activity** (Games and Group work)
1	Observation	• Questionnaire
2.	Identification of a Leader	• Give a task and observe the leader • Discuss the qualities and his /her leadership style • Ask the other members to identify the leadership qualities • Reflection on the self
3	Skills	• Decision making – followed by discussion
4	Building Team spirit	• Motivation – Intrinsic and Extrinsic Training- Communication- Challenge

S.No	Title	Competency
1.	Concept of life skills	• Explain need and impact of Life skills
2.	Enhancing self esteem	• Follow the steps to build a positive self esteem
3.	Goal setting	• Practice the effective goal setting process
4.	Positive attitude	• Practice the steps to enhance positive attitude. • Observe the effects of peers on self and vice-versa.

5.	Managing emotions	• Practice the steps to manage emotional intelligence • Identify different types of emotions • Exercise control over Emotions
6.	Stress management	• Practice stress management techniques
7.	Time management	• Practice Time management techniques
8.	Interpersonal skills	• Identify positive and Negative Relations
9.	Creativity	• Lead a small group for accomplishment of a given task. • Build positive relationships.
10.	Problem solving and decision making skills	• Identify the various Problem solving and decision making skills • Make appropriate Decision
11.	Assertive and non Assertive behavior	• Practice Assertive and non Assertive behavior
12.	Leadership skills	• Exhibit Leadership skills

COURSE CONTENT

1.0 Concept of life skills

Definition of life skills, Need and impact of life skills programme

2.0 Enhancing self esteem

Concept, Characteristics of high and low self esteem people, Advantages of high selfesteem, Causes of low esteem- Identification of behavior patterns of low self esteem – Practice session of Questionnaire / Game -Steps to build a positive self esteem – Practice session of Role play

3.0 Goal setting

Significance of goal setting,Concepts of Wish, Dream, and Goal Identify Wish, Dream, and Goal and differentiate among them Reasons for not setting the goals, Barriers to reach goals,Identify Barriers Effective goal setting process & Practice Effective goal setting

4.0 Positive attitude

concept ,affects of negative attitude,attitude of self and peers,effect of peers on self and vice-versa, steps to enhance positive attitude,strategies to enhance positive attitude

5.0 Managing emotions

Problem-definition, performance problems ,Categorize the problems,

barriers to the solutions to problems.

6.0 Stress management

Concept of stress, Types of stress, causes of stress, reactions of stress, coping with the stress, stress relaxing techniques, changing personality and cognitive patterns

7.0 Time management

Definition, significance of various Time stealers, Time management, strategies to set priorities, steps to overcome barriers, Time-Management skills- its advantages.

8.0 Interpersonal skills

Significance of Interpersonal skills,positive relationships- Advantages, negative relationships- Disadvantages

9.0 Creativity

Definition, Invention, Innovation, Novelty, creative thinking , observation and imitation , improvement, Expertise ,skill, and motivation, components of Creativity ,Convergent thinking and divergent Thinking, various steps involved in Scientific approach to creative thinking namely , Factors affecting the creativity in Individuals, Vertical thinking and lateral thinking.

10.0 Problem solving and decision making skills

Definition, performance problems –analysis, categorizing,barriers to the solutions to problems.

11.0 Assertive and non Assertive behavior

Types of Behaviors – their characteristics, need for controlling and avoiding aggressive behaviors, making and refusing an assertive request – their evaluation, importance of goal setting, method of giving feedback.

12.0 Leadership skills

Concept , importance, Role of a Leader in an Organization, Traits of effective Leader, Managing and leading, leadership styles-their Comparison, theories of leadership, strategies to develop effective leadership, importance of Decision making, concept of ethical leadership and moral development.

REFERENCES

1.Robert NLussier, Christopher F. Achua Leadership: Theory, Application, & Skill development: Theory, Application.

MICROCONTROLLER APPLICATIONS LAB PRACTICE

SUBJECT TITLE : MICROCONTROLLER APPLICATIONS LAB PRACTICE

SUBJECT CODE : EC-509

PERIODS/WEEK : 04

PERIODS/SEMESTER : 60

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.	EXPERIMENT	**No. of Periods**
1.	Familiarization with Microcontroller Kit	20
2.	Instruction set	10
3.	Counters ,Timers Interrupts and Flags	20
4	Interfacing	10
	Total	60

LIST OF EXPERIMENTS

Familiarization with Microcontroller Kit & Simulators

1. To Work with microcontroller kits and Simulators

a) To Familiarize with 8051 Microcontroller Kit

b) To Familiarize with 8051 simulator EDSIM 51 (or similar)

c) To Write small ALP to verify different register addressing techniques

II . 8051 Instruction set

2. To Practice **Arithmetic instructions of 8051**

a) Write an ALP to demonstrate Addition , subtraction , division and multiplication of 8 bit numbers using immediate data access.

b) Write an ALP to Add and Subtract 16 bit numbers

c) Write an ALP to find the Square and Cube of a decimal number

d) Write an ALP to find LCM of given 3 decimal numbers

e) Write an ALP To find HCF of given 3 decimal numbers

3. To Practice **Data transfer instructions**

a) Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X40-0X49 (without overlap)

b) Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X35-0X39 (with overlap)

c) Write an ALP to Block exchange – 10bytes of data between 0X30-0X39 to 0X40-0X49

d) Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X1000-0X1009 (Internal to external memory or vice versa)

4. To Practice Data Manipulation

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)

c) To Sort 10bytes of data from 0X30-0X39 in Ascending order

d) To Sort 10bytes of data from 0X30-0X39 in Descending order

5.To Practice Boolean & Logical instructions :

a) To Find 2's complement of a number using (CPL) instruction

b) To Convert Packed to Unpacked BCD (bit Masking) Using (ANL) Instruction

c) To convert Unpacked BCD to ASCII Using (ORL) instruction.

d) To Convert ASCII to BCD Using(XRL) instruction.

III. To implement Counters ,Timers Interrupts and Flags

6. To implement a HEX up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter)

a) To implement BCD(00-99) up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter)

7.To Implement Delays and Timers

a) To write a program in assembly language and in "C" produce required time delay a) by Using instructions only b) by Using Timers

b)To write a program in assembly language and C to verify Call and return instructions with port programming

c) To write a program in assembly language and C to verify Logical or Delay loop using Call and return instructions

8. To Use 8051 Interrupts and Flags

To 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.

IV .To practice Interfacing Techniques

9. Micro controller interfacing

a) Interfacing Switches and LEDS to 8051

i) To make an LED connected to port 1.5, light up for specific time on pressing a switch connected to port 2.3

ii) To Write a Program to make an LED connected to pin 1.7 to blink at a specific rate

iii) To Connect a Relay in place of LED to control a AC 230 V Lamp

10. To Interface 3-digit 7SEGMENT LED DISPLAY using timer for digit scan

a) To Interface a Single DOTMATRIX DISPLAY and display the given number

11. To Interface a (3x4 matrix) Key Board to 8051

12. To control the direction of rotation of a small DC motor

13. To interface I^2C BUS Device using DS1307 IC .

a)To interface a) ADC IC b) DAC IC

b) To interface Microcontroller serial interface to PC COM port

14. To Burn executable code into EPROM

b) To burn executable code into flash memory for 89C51

Competencies and Key Competencies to be achieved.

Exp No	Name of the Experiment (No of Periods)	Competencies	Key Competencies
1	To Work 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 verify different register addressing techniques	➢ 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 contents and the Flags	➢ Enter the ALP at the specified address and execute ➢ Use the simulator for the same ALP and verify the register 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. b) Write an ALP to Add and	➢ 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

	Subtract 16 bit numbers c) Write an ALP to find the Square and Cube of a decimal number d) Write an ALP to find LCM of given 3 decimal numbers e) Write an ALP To find HCF of given 3 decimal numbers		
3	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. b) Write an ALP to Add and Subtract 16 bit numbers c) Write an ALP to find the Square and Cube of a decimal number d) Write an ALP to find LCM of given 3 decimal numbers e) Write an ALP To find HCF of given 3 decimal numbers	➢ 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	To Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X40-0X49 (without overlap) (3) 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

	b) Write an ALP to Block exchange – 10bytes of data between 0X30-0X39 to 0X40-0X49 c) Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X1000-0X1009 (Internal to external memory or vice versa)		
4	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) c) To Sort 10bytes of data from 0X30-0X39 in Ascending order d) 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
4	To Find 2's complement of a number using (CPL) instruction (3) a) To Convert Packed to Unpacked BCD (bit Masking) Using (ANL)	➢ Enter the ALP at the specified address and execute ➢ Use Boolean 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

	Instruction b) To convert Unpacked BCD to ASCII Using (ORL) instruction. c) To Convert ASCII to BCD Using(XRL) instruction.		contents
5	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) up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter)	➢ Enter the ALP at the specified address and execute ➢ Use timer/Counter	➢ Enter the ALP at the specified address and execute ➢ Use timer/Counter
6	To implement a HEX up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter) (3) a) To implement BCD(00-99) up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter)	➢ Enter the ALP at the specified address and execute ➢ Use timer/Counter	➢ Enter the ALP at the specified address and execute ➢ Use timer/Counter
7	To Implement Delays using Timers (3) a) To write a program in assembly language and in "C" produce required time delay a) by Using instructions only b) by Using	➢ Enter the "C" program in the simulator ➢ Debug and execute ➢ Use CALL and RET Instructions ➢ Verify STACK	➢ Enter the "C" program in the simulator ➢ Debug and execute ➢ Use CALL and RET Instructions ➢ Verify STACK

	Timers b)To write a program in assembly language and C to verify Call and return instructions with port programming c) To write a program in assembly language and C to verify Logical or Delay loop using Call and return instructions	Contents in the Simulator	Contents in the Simulator
8	To Use 8051 Interrupts and Flags (3) To 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
9	Micro controller interfacing a) Interfacing Switches and LEDS to 8051 (3) i) To make an LED connected to port 1.5, light up for specific time on pressing a switch connected to port 2.3 ii) To Write a Program to make an LED connected to pin 1.7 to blink at a specific rate ii) To Connect a Relay in place of LED to control a AC 230 V Lamp	➢ Enter the ALP at the specified address ➢ Rig up the circuit ➢ Execute the Program	➢ Enter the ALP at the specified address ➢ Rig up the circuit ➢ Execute the Program

10	To Interface 3-digit 7SEGMENT LED DISPLAY using timer for digit scan (3) a) To Interface a Single DOTMATRIX DISPLAY and display the given number 11. To Interface a (3x4 matrix) Key Board to 8051 12. To control the direction of rotation of a small DC motor	➢ Rig Up the circuit ➢ Enter The C Program in the simulator ➢ Debug and Execute	➢ Rig Up the circuit ➢ Enter The C Program in the simulator ➢ Debug and Execute
11	To Interface a (3x4 matrix) Key Board to 8051 (3)	➢ Rig Up the circuit ➢ Enter The C Program in the simulator ➢ Debug and Execute	➢ Rig Up the circuit ➢ Enter The C Program in the simulator ➢ Debug and Execute
12	To control the direction of rotation of a small DC motor (3) .	➢ Rig Up the circuit ➢ Enter The C Program in the simulator ➢ Debug and Execute	➢ Rig Up the circuit ➢ Enter The C Program in the simulator ➢ Debug and Execute
13	To interface I^2C BUS Device using DS1307 IC . (3) a) To interface i) ADC IC ii) DAC IC b) To interface Microcontroller serial interface to PC COM port	➢ Rig Up the circuit ➢ Enter The C Program in the simulator ➢ Debug and Execute	➢ Rig Up the circuit ➢ Enter The C Program in the simulator ➢ Debug and Execute
14	To Burn executable code into EPROM (3) b) To burn executable code into flash memory for 89C51	➢ Compile the C Program ➢ Use the Programmer SW to Load the .HEX file into the Programmer Memory ➢ To burn the code into EPROM/FLASH Memory of Controller	➢ Compile the C Program ➢ Use the Programmer SW to Load the .HEX file into the Programmer Memory ➢ To burn the code into EPROM/FLASH Memory of Controller

		➢ To SECURE the CODE by programming the LOCK feature	➢ To SECURE the CODE by programming the LOCK feature

FIELD PRACTICES

Subject Title : FIELD PRACTICES
Subject code : EC-510

Periods/Week : 07

Periods/Semester : 105

Rationale: Field practices subject is introduced as a substitute for industrial Training. This course is aimed at imparting same skills a student would acquire in the industry during the initial training period. in other words industry like environment is simulated in the institution during this course to prepare the students for Industry.

TIME SCHEDULE

S. No.	EXPERIMENT	**No. of Periods**
1.	Standard practices in the Industry	6
2.	Manufacturing	32
3.	Maintenance & Servicing	32
4	Organising	10
5	Documentation &Data processing	10
	Total	90

General List Of Industry Practices (Other Industry practices may be added)

I. Standard practices in the Industry

1. To Practice Industrial Safety, First Aid, dress code, tie, shoe etc…)
    i) To Keep workplace clean and tidy.
    ii) To maintain the Laboratories
    iii) To follow Industry Mannerisms and Etiquette (Greeting , Smiling , Shaking hands - Polite conversation, Requesting etc) –To practice the use first aid and fire extinguishers

II .Manufacturing

2. a) To carry out following activities

    i) prepare wires ii) Practice wire bunching iii) Make wire tips/joints iv) Keep the component set ready for population on PCB

    b) To Set up layout for work space for fabrication .

    c) To Supervise Manufacturing/ Testing activities.

3. To Practice soldering of SMD components
4. To Design /Prepare drawing for an electronic circuit/ equipment i) Manually ii) Using software tools
5. To fabricate /Rig up Prototype circuit
    i) To prepare circuit boards for the experiments mentioned in the curriculum and test.
6. To prepare required test jigs or circuits for the above and test
7. To Trouble shoot the faults in the equipment using CRO, DMM, Logic Analyzer etc.
8. To carry out Reverse Engineering(Decode the circuit from a circuit board and interpret/identify the circuit
9. To follow the standard procedures/Instructions given in the Equipment manual to operate and set up the equipment
10. To work with sophisticated tools/equipment used in electronic industry as per standard procedure

11. To use software tools like Pspice , Multisim , Matlab etc and design the circuits
12. To Carry out Quality assurance Tests

III. Maintenance & Servicing

13. To maintain a) Electrical wiring/equipment in the laboratory b) Institute Earthing c) UPS Batteries
14. To maintain/Troubleshoot computers and Computer Networks in the institute
15. To Install and Test equipment like i) UPS ii) inverters, iii) Servo stabilizers

IV. Organising

16. To prepare i) Inventory, ii) follow industry procedures, iii) Maintain log iv) housekeeping v) Documentation
17. To carry out market survey to find the resources , Equipment suppliers etc.
18. To organize seminars , Events and presentations.
    i) To Set up Computer-LCD projector / PA system , etc

V.Documentation &Data processing

19. To practice Data processing on computer

i) To browse the internet and search for the most relevant information on latest trends in communication engineering (or any other engineering topic) and prepare a report /presentation

20. To prepare Project reports/Manuals for the kits prepared

Competencies and Key Competencies to be achieved

Exp No	Name of the Experiment	Competencies	Key Competencies
1	To Practice Industrial Safety, First Aid, dress code, tie, shoe etc…) i) To Keep workplace clean and tidy. ii) To maintain the Laboratories iii) To follow Industry	➢ Clean the equipment ➢ Follow Industry mannerisms ➢ Use first aid &act under emergencies ➢ Maintain Laboratories	➢ Follow Industry mannerisms ➢ Maintain Laboratories ➢ Use first aid &act under emergencies

	Mannerisms and Etiquette (Greeting , Smiling , Shaking hands - Polite conversation, Requesting etc) – iv) To practice the use first aid and fire extinguishers		
2	To carryout following activities i) prepare wires ii) Practice wire bunching iii) Make wire tips/joints iv) Keep the component set ready for population on PCB b)To Prepare layout for workspace to carry fabrication c)To Supervise fabrication activities	To prepare ➢ Wire tips ➢ Bunching ➢ Select components ➢ Set up experiment ➢ Supervise	To prepare ➢ Wire tips ➢ Bunching ➢ Select components ➢ Set up experiment ➢ Supervise
3	To Practice soldering of SMD components	➢ Handle SMD components ➢ Solder SMD components with proper precautions ➢ Testing the soldered joints	➢ Handle SMD components ➢ Solder SMD components with proper precautions ➢ Testing the soldered joints
4	To Design /Prepare drawing for an electronic circuit/ equipment i) Manually ii) Using software tools	➢ Prepare drawings /Circuits and layouts both manually and by using computer	➢ Prepare drawings /Circuits and layouts both manually and by using computer
5	To fabricate /Rig up Prototype circuit	➢ To prepare prototypes ➢ Carry out necessary modifications ➢ Testing ➢ Troubleshooting ➢ Search resources	➢ To prepare prototypes ➢ Carry out necessary modifications ➢ Testing ➢ Troubleshooting ➢ Search resources
6	To prepare required test jigs or circuits for the above and test	➢ Prepare/Design suitable test jigs ➢ Test the circuits	➢ Prepare/Design suitable test jigs ➢ Test the circuits
7	To Trouble shoot the faults in the equipment using CRO	➢ Identify the fault ➢ Troubleshoot ➢ Replace/Substitute	➢ Identify the fault ➢ Troubleshoot ➢ Replace/Substitute

	DMM, Logic Analyzer etc.	➢ Rectify the problem	➢ Rectify the problem
8	To carry out Reverse Engineering(Decode the circuit from a circuit board and interpret/identify the circuit	➢ Reading the circuit Diagrams ➢ Identifying the circuit in the PCB ➢ Decoding the circuit ➢ Preparing a drawing ➢ Verifying the drawing ➢ Implement the circuit ➢ Testing the circuit ➢ Modifying ➢ Prepare prototype	➢ Reading the circuit Diagrams ➢ Identifying the circuit in the PCB ➢ Decoding the circuit ➢ Preparing a drawing ➢ Verifying the drawing ➢ Implement the circuit ➢ Testing the circuit ➢ Modifying ➢ Prepare prototype
9	To follow the standard procedures/Instructions given in the Equipment manual to operate and set up the equipment	➢ Read the Instructions and Follow ➢ operate the equipment as per procedure ➢ Verify the results	➢ Read the Instructions and Follow ➢ operate the equipment as per procedure ➢ Verify the results
10	To work with sophisticated tools/equipment used in electronic industry as per standard procedure	➢ work with sophisticated tools/equipment used in electronic industry as per standard procedure ➢ Follow due precautions	➢ work with sophisticated tools/equipment used in electronic industry as per standard procedure Follow due precautions
11	To use software tools like Pspice , Multisim , Matlab etc and design the circuits	➢ use software tools like Pspice , Multisim , Matlab etc for designing the circuits ➢ Implement the circuit ➢ Modify using software tools	➢ use software tools like Pspice , Multisim , Matlab etc for designing the circuits ➢ Implement the circuit ➢ Modify using software tools
12	To Carry out Quality assurance Tests	➢ Use test equipment ➢ Follow pre testing &Post testing procedures ➢ Troubleshoot ➢ Design	➢ Use test equipment ➢ Follow pre testing &Post testing procedures ➢ Troubleshoot ➢ Design
13	To maintain a) Electrical wiring/equipment in the laboratory b) Institute Earthing c) UPS Batteries	➢ Replace fuses- ➢ Repair Power cords ➢ Replace faulty Sockets and Plugs ➢ Replace faulty Tube lights/Lamps ➢ Maintain earthing ➢ Maintain UPS Batteries	➢ Replace fuses- ➢ Repair Power cords ➢ Replace faulty Sockets and Plugs ➢ Replace faulty Tube lights/Lamps ➢ Maintain earthing ➢ Maintain UPS Batteries
13	To maintain/Troubleshoot computers and Computer	➢ Act as Computer administrator in the computer lab	➢ Act as Computer administrator in the computer lab

	Networks in the institute	➢ Maintain LAN ➢ Install/Run Antivirus ➢ Remove unwanted files ➢ Rectify any computer problems	➢ Maintain LAN ➢ Install/Run Antivirus ➢ Remove unwanted files ➢ Rectify any computer problems ➢
14	To Install and Test equipment like i) UPS ii) inverters, iii) Servo stabilizers	➢ Install Laboratory Equipment as per procedure ➢ Install UPS ➢ Make special wiring for UPS/Inverter ➢ Install Servo Stabilizer	➢ Install Laboratory Equipment as per procedure ➢ Install UPS ➢ Make special wiring for UPS/Inverter ➢ Install Servo Stabilizer
15	To prepare i) Inventory ii) follow industry procedures, iii) Maintain log iv) housekeeping	➢ Prepare Bill of materials ➢ Material requirement ➢ Place indent ➢ Maintain log ➢ Reporting ➢ House keeping	➢ Prepare Bill of materials ➢ Material requirement ➢ Place indent ➢ Maintain log ➢ Reporting ➢ House keeping
16	To carry out market research to find the resources	➢ Identify the product/component ➢ Search for similar / same items ➢ Compare features ➢ Check thePrice/cost effectiveness ➢ Test the product for suitability ➢ Find the Suppliers	➢ Identify the product/component ➢ Search for similar / same items ➢ Compare features ➢ Check the cost effectiveness ➢ Test the product for suitability ➢ Find the Suppliers
17	To organize seminars Events and presentations. i) To Set up Computer-LCD projector / PA system , etc	➢ Organize Events/Seminars ➢ Exhibit Leadership qualities ➢ Show Creativity ➢ Time management skills ➢ Set up laptop LCD projector etc for the event	➢ Organize Events/Seminars ➢ Exhibit Leadership qualities ➢ Show Creativity ➢ Use Time management skills ➢ Set up laptop LCD projector etc for the event
19	To practice Data processing on computer i) To browse the internet and search for the most relevant information on latest trends in communication engineering (or any other engineering topic)	➢ Use computer ➢ Browse internet &search ➢ Download information ➢ Convert formats ➢ Prepare reports ➢ Prepare Presentation ➢ Save them into cloud storage	➢ Use computer for ➢ Checking mails/assignments/ notices etc ➢ Upload /Download information ➢ Search the web for required information ➢ Prepare laboratory

	and prepare a report /presentation		Documentation
20	To prepare Project reports/Manuals for the kits prepared	➢ Use MS Word ➢ Browse and search the internet ➢ Download information ➢ Convert formats	➢ Use MS Word ➢ Browse and search the internet ➢ Download information ➢ Convert formats

DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
VI Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / Sem	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
EC- 601	Industrial Management	4	-	60	3	20	80	100
EC-602	Industrial Electronics	4	-	60	3	20	80	100
EC - 603	Electronic Circuit Design &Quality Assurance	4	-	60	3	20	80	100
EC - 604	Mobile Communications	4	-	60	3	20	80	100
EC - 605	Advanced Microcontrollers & DSP	4	-	60	3	20	80	100
EC - 606	Digital Circuit Design through Verilog HDL	4	-	60	3	20	80	100
PRACTICAL:								
EC- 607	Industrial Electronics Lab	-	6	90	3	40	60	100
EC -608	Verilog HDL Programming Lab	-	3	45	3	40	60	100
EC -609	Advanced Microcontroller Lab	-	3	45	3	40	60	100
EC -610	Project work	-	6	90	3	40	60	100
	TOTAL	24	18	630		280	720	1000

INDUSTRIAL MANAGEMENT

Subject Title : INDUSTRIAL MANAGEMENT
Subject Code : EC-601
Periods/Week : 04
Periods/semester : 60

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of marks	Short questions	Essay questions
1.	Overview Of Business	4	6	2	
2.	Management Process	6	13	1	1
3.	Organizational Management	6	13	1	1
4.	Human Resource Management	12	23	1	2
5.	Financial Management	10	16	2	1
6.	Materials Management	8	13	1	1
7.	Project Management	14	26	2	2
	Total	60	110	10	8

OBJECTIVES

Upon completion of the course the student shall 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 Explain the Management Process:

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.

3.0 Appreciate the need for Organizational Management

3.1 Define Organization

3.2 List the Types of organization :a) Line b) Line & staff c) Functional d) Project

3.3 Explain the four types of organization.

3.4 Define departmentatization.

3.5 Explain the following types of departmentalizations

i) Centralized & Decentralized

ii) Authority & Responsibility

iii) Span of Control

3.6 Explain the Forms of ownership

i)Proprietorship

ii) Partnership

iii) Joint stock

iv) Co-operative Society

v)Govt. Sector

4.0 Appreciate the need for Human Resource Management

4.1 Define Personal Management.

4.2 Explain the functions of Personal Management

4.3 Define Staffing .

4.4 State the importance of HR Planning.

4.5 Explain the various Recruitment Procedures.

4.6 Explain the need for Training & Development .

4.7 State the various types of training procedures(Induction, Skill Enhancement etc)

4.8 State the different types of Leaderships,

4.9 Explain the Maslow's Theory of Motivation

4.10 Explain the Causes of accident and the Safety precautions to be followed.

4.11 Explain the importance of various Acts – Factory Act, ESI Act, Workmen Compensation Act, Industrial Dispute Act etc.

5.0 Explain the basics of Financial Management

5.1 State the Objectives of Financial Management.

5.2 State the Functions of Financial Management.

5.3. State the necessity of Capital Generation & Management.

5.4 List the types of Capitals.

5.5 List the Sources of raising Capital.

5.6 Explain the Types of Budgets

i) Production Budget (including Variance Report)

ii) Labour Budget.

5.7 Describe Profit & Loss Account (only concepts) .

5.8 Describe the proforma of Balance Sheet.

5.9 Explain i) Excise Tax ii) Service Tax iii) Income Tax iv) VAT v) Custom Duty.

6.0 Explain the importance of Materials Management

6.1. Define Inventory Management (No Numerical).

6.2 State the objectives of Inventory Management.

6.3 Explain ABC Analysis.

6.4 State Economic Order Quantity.

6.5 Describe the Graphical Representation of Economic Order Quantity.

6.6 State the objectives of Purchasing.

6.7 State the functions of Purchase Department.

6.8 Explain the steps involved in Purchasing.

6.9 State the Modern Techniques of Material Management.

6.10 Describe the JIT / SAP / ERP packages.

7.0 Explain the importance of Project Management

7.1 State the meaning of Project Management.

7.2 Describe the CPM & PERT Techniques of Project Management.

7.3 Identify the critical path and find the project duration.

7.4 Explain the concept of Break Even Analysis

7.5 Define Quality.

7.6 State the concept of Quality.

7.7 Describe the various Quality Management systems.

7.8 Explain the importance of Quality policy, Quality control, Quality Circle.

7.9 State the principles of Quality Assurance.

7.10 State the concepts of TQM , Kaizen 5's and 6 sigma.

7.11 State the constituents of ISO 9000 series standards.

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.

3.0 Organization 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.

4.0 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.

5.0 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.

6.0 Material Management

Inventory Management – objectives of Inventory Management – ABC Analysis – Economic order Quality – Purchasing – Objectives of purchasing – Functions – Procedures – Material Management - JIT / SAP / ERP.

7.0 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.

REFERENCES

1. Dr. O.P. Khanna - Industrial Engg &Management-Dhanpath Rai & sons New Delhi
2. Dr. S.C. Saxena & W.H. Newman& E.Kirby Warren-Business Administration &Management -Sahitya Bhavan Agra
3. Andrew R. McGill -The process of Management-Prentice- Hall
4. Rustom S. Davar -Industrial Management-Khanna Publication

INDUSTRIAL ELECTRONICS

Subject Title : Industrial Electronics
Subject Code : EC-602
Periods/Week : 04
Periods/Semester : 60

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	16	26	2	2
2	Transducers & Ultrasonics	14	26	2	2
3	Industrial heating & Welding	10	21	2	1 ½
4	PLC & Programming	12	21	2	1 ½
5	Control Engg	**8**	**16**	**2**	**1**
	Total	**60**	**110**	**10**	**8**

OBJECTIVES

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

the following:

1.0 Understand the construction and working of Power Electronic Devices
1.1 List different thyristor family devices.
1.2 Sketch the ISI circuit symbols for each device.
1.3 Explain constructional details of SCR.
1.4 Draw & Explain the Volt-Ampere characteristics of SCR.
1.5 Mention the ratings of SCR.
1.6 Explain the construction of GTO SCR
1.7 Compare the characteristics of GTO SCR and SCR.
1.8 Give constructional details of Diac & Triac.
1.9 Draw & Explain Volt-ampere characteristics of Diac & Triac under forward/Reverse bias.
1.10 State the different modes of Triac triggering.
1.11 Distinguish between SUS, SBS, SCS & LASCR
1.12 Draw & Explain SCR circuit triggered by UJT.

1.13 Explain power control circuits Diacs, Triacs & SCR's
1.14 Briefly explain the working of Reverse conducting thyristor (RCT), Asymmetrical SCR (ASCR), Power BJT, Insulated gate Bipolar transistor (IGBT), MOS-controlled thyristors (MCT) with characteristics.
1.15 Explain the mechanism in protecting power devices.
1.16 Study of Manufacturer's data sheet of power electronic devices.
1.17 List the applications of power electronic devices.
1.18 Explain the working of MOSFET based Inverter circuit.
1.19 With a block diagram explain the working of a) Off Line UPS b) Online UPS
1.20 Explain PWM Voltage control of UPS
1.21 Explain the limitations of series Voltage regulated power supplies
1.22 Explain the working of SMPS with block diagram
1.23 Mention any 3 applications of SMPS
1.24 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 potentio metric transducer.
2.4 Explain the working principle, construction and applications of capacitive and inductive transducers.
2.5 Explain the working principle, construction and applications of LVDT.
2.6 Explain the working principle, construction and applications of Piezo electric transducer.
2.7 Explain the working principle and applications of RTD & Thermocouple transducer.
2.8 Explain the application of transducer in Accelerometer, servomotors, and Tachogenerators.
2.9 Explain the term Ultrasonic.
2.10 Mention methods of generating ultrasonic waves.
2.11 Draw and explain pulsed-echo ultrasonic flaw detector
2.12 Explain the principle of MEMS devices
2.13 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 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 method.
4.5 Give the ladder logic symbols.
4.6 Explain the meaning of above symbols
4.7 Explain current flow (Forward and Reverse current)
4.8 Explain the Ladder diagrams
4.9 Explain the use of statement list .
4.10 Explain control systems flow charts.
4.11 Write simple Ladder program using bit instructions Timer instructions and counter instructions
4.12 List types of PLCs.
4.13 List the features of poular PLCs like Siemenis , Allenbradly .
4.14 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 3 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 CONTENTS

1. Power Electronic Devices

Types of power semiconductor devices – SCR, Triac, Power BJT, IGBTConstruction,

Working principle of all devices, symbol. Two transistor analogy for SCR – V-I characteristics, Forward break over voltage, latching

current, holding current, turn on triggering time, turn off time - triggering of

SCR using UJT – protection of power devices-Applications.

2. Transducers & Ultrasonics

Introduction, classification of transducers, strain gauge, variable

resistance transducer, capacitive, inductive, piezoelectric, LVDT.

Thermocouples,Transducer applications - accelerometers,

Tachogenerators, Servomotors Ultrasonic- generation –Pulsed echo

ultrasonic flaw detector

3. **Industrial Heating and Welding**
   Induction heating, Dielectric heating, and Resistance welding.

4. **PLCs & Programming**
   Relay logic control panel – PLC based control panel - Architecture of PLC.
   Programming software – Bit instructions – Timer/Counter instructions – Compare instructions – Move instructions – Math instructions – Program control instructions - Memory organization in PLC – analog inputs.

Control Engineering

basic block diagram - open loop and closed loop system - gain equations-

REFERENCE BOOKS

1. Power Electronics by P.C.Sen.
2. Industrial Electronics and Control by S.K.Bhattacharya, S.Chatterjee
3. User manuals of PLCs, SCADA
4. Control Engg, by Nagarath & Gopal

ELECTRONIC PRODUCT DESIGN & QUALITY ASSURANCE

Subject Title : Electronic Product Design and Quality Assurance

Subject Code : EC-603
Periods/Week : 04

Periods/Semester : 60

Rationale: This is a new subject introduced in the final year based on the suggestions from the industry . This subject is aimed to make the students understand the steps involved in product design and quality assurance. This course helps the students immediately adapt to the procedures in R&D departments in the industry.

Sl	Major Topics	No of Periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Product Design and Development Stages	14	29	3	2
2	PCB design	14	26	2	2
3	Hardware design and Testing	12	16	2	1
4	Product testing	12	26	2	2
5	Documentation	06	13	1	1
Total		60	110	10	8

OBJECTIVES

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

1.0 Understand Product design and Development stages

1.1 Explain the concept of product development with a block diagram.
1.2 Give classification of an Electronic Product.
1.3 Explain The Techno Commercial Feasibility of a product.
1.4 Explain customer requirements
1.5 Explain R&D prototype Assessment of reliability.

1.6 Explain factors for reliability of equipment.
1.7 Explain quality considerations.
1.8 List 6 reasons for failure.
1.9 Explain Bath tub curve
1.10 Explain Concept of Ergonomic and aesthetic considerations of pilot production
1.11 Explain Product packaging and storage
1.12 Estimate power supply requirements
1.13 List two types of Power supply protection devices
1.14 Define Noise reduction.
1.15 Explain Grounding
1.16 Explain Shielding and guarding techniques
1.17 Explain Thermal management

2.0 Explain PCB design

2.1 List 6 important properties of Laminates
2.2 General layout considerations for analog and digital circuits
2.3 Explain routing for better Decoupling
2.4 Mention Recommendations for decoupling and bypassing.
2.5 Explain layout considerations for mixed signal circuits
2.6 Explain Component mounting considerations.
2.7 study of packages for discrete devices and ICs calculation of parasitic elements in PCB
2.8 List two types of High speed EMI reduction methods in PCB designing
2.9 Define Cross talk

3.0 Understand Hardware design and Testing

3.1 Use of logic analyzer ,
3.2 Explain the use of Digital storage oscilloscope in testing .
3.3 Explain Mixed signal oscilloscope for hardware testing ,
3.4 List two types of signal integrity issues
3.5 State the uses and limitations of different types of analysis
3.6 Explain DC operating point analysis
3.7 Explain Ac analysis, Transient analysis
3.8 Explain the use of Software tools for simulation and testing.

4.0 Explain Product testing

4.1 Explain the importance of product testing
4.2 Environmental testing
4.3 Explain Dry heat testing
4.4 Explain Vibration testing
4.5 Explain random testing.
4.6 Explain Bump testing
4.7 Explain Temperature extreme testing for linear and step strss profiles
4.8 Explain Vibration & temperature cycling
4.9 Explain EMI EMC compliance testing standardization
4.10 Explain UL and CE Certification of industrial electronic products.

5.0 Understand Documentation

5.1 Explain the importance of documentation

5.2 List types of documentation.
5.3 Explain types of documents
5.4 List rules for preparing effective document
5.5 Explain PCB documentation
5.6 Explain Assembly and fabrication related documentation Laminate grade
5.7 Explain preparing a manual document
5.8 Explain the details of service manual
5.9 Explain test report/manuals
5.10 Explain product documentation Bill of materials Production test specifications

COURSE CONTENTS

1. Introduction to Product design and Development stages :Introduction, Explain The Techno Commercial Feasibility of specifications, Explain R&D prototype Assessment of reliability, Concept of Ergonomic and aesthetic considerations of pilot production, Estimating power supply requirements, Power supply protection devices, Noise reduction,. Grounding, Shielding and guarding techniques, Thermal management,

2. PCB design: General layout considerations for analog and digital circuits Poer and ground Traces, routing for better Decoupling, Recommendations for decoupling and bypassing, layout considerations for mixed signal circuits, Component mounting considerations,study of packages for discrete devices and ICs calculation of parasitic elements in PCB,High speed EMI reduction methods in PCB designing, cross talk,

3. Hardware design and Testing: Use of logic analyzer ,Digital storage oscilloscope, Mixed signal oscilloscope for hardware testing ,signal integrity issues ,use and limitations of different types of analysis, DC operating point analysis , Ac analysis, Transient analysis,

4**. Product testing:** Introduction to product testing,Environmental testing: Dry heat, Vibration < temperature cycling, Bump and Humidity tests as specified in IS standards, EMI EMC compliance testing standardization, UL and CE Certification of industrial electronic products,

5.**Documentation :**PCB documentation, Assembly and fabrication related documentation Laminate grade, drilling details Plating, bare board testing, product documentation User manual service maintenance manual Bill of materials Production test specifications

REFERENCE:

1. Electronic Product Design, R.G.Kaduskar, V.B.Baru, Wiley India
2. Printed Circuit Board design and technology-Walter CBosshart TMH-CEDT
3. Handbook of Printed Circuit manufacturing – Raymond H. Clark (Van Nostrand Reinhold Company, New York)
4. Electronic testing and fault diagnosis –G.C. Loveday (Ah wheeler Publication, India)

MOBILE COMMUNICATION

Subject Title : Mobile Communication

Subject Code : EC-604

Periods/Week : 04

Periods/Semester : 60

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	8	16	2	1
2	Cellular system design fundamentals	14	26	2	2
3	Multiple access techniques	16	26	2	2
4	Digital Cellular mobile system	14	21	2	2
5	Modern wireless communication systems	8	16	2	1
	Total	**60**	**110**	**10**	**8**

OBJECTIVES

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

1.0 Introduction to wireless communication system

1.1 List the limitations of conventional mobile phone system.
1.2 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 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
2.18 Solve problems on system capacity.

3.0 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 the Direct sequence spread spectrum (DSSS) technique
3.11 Explain the frequency hopped spread spectrum (FHSS) multiple access technique.
3.12 Explain code division multiple access technique.
3.13 List the features and advantages of CDMA
3.14 Compare FDMA, TDMA and CDMA
3.15 State near-far effect in CDMA
3.16 Explain the concept of soft hand off and power control in CDMA

4.0 Digital Cellular mobile system

4.1 List the specifications of analog mobile phone system (Advanced mobile phone system AMPS).
4.2 Explain the radio interface of AMPS.
4.3 State the features of Narrow band AMPS (N-AMPS)
4.4 List the drawbacks of analog cellular system.
4.5 List the features of digital cellular system.
4.6 Explain the United States Digital Cellular system (IS-54)
4.7 Explain the radio interface specifications of USDC
4.8 Explain the Global system for mobile communication (GSM)
4.9 Explain the GSM architecture with block diagram.
4.10 List various interfaces in GSM architecture
4.11 Explain the GSM radio subsystem
4.12 Explain the frame structure of the GSM
4.13 List the service and security aspects of GSM.
4.14 Compare AMPS and GSM
4.15 List the advantages of GSM over AMPS

5.0 Modern wireless communication systems

5.1 List the draw backs of GSM system.
5.2 List the features of GPRS
5.3 List the features of EDGE
5.4 Compare the features of GSM, GPRS and EDGE systems
5.5 List specifications of Digital European Cardless Telecommunication (DECT) system.
5.6 Draw the architecture of DECT
5.7 Explain the architecture of DECT
5.8 Basic concept of Wireless local loop (WLL)
5.9 List the salient features of 3G system
5.10 List the advantages of 3G over earlier versions
5.11 List the basic concepts of 4G aspects

COURSE CONTENTS

1. Introduction to wireless communication systems : Evolution of cellular mobile communication-basic cellular system-various mobile radio systems-important definitions-simplex, half duplex and full duplex channels-FDD- TDD-process of call progress

2. Cellular system design fundamentals: Cellular concept-frequency reuse-capacity of a cellular system-cochannel interference-hand off-channel assignment-Methods of improving coverage and capacity- micro cell-umbrella cell- problems.

3. Multiple access techniques: Introduction-types of multiple access techniques-FDMA-TDMA-spread spectrum technique-DSSS-FHSS-CDMA-soft hand off- near far effect-power control

4. Digital Cellular mobile system : Advanced mobile phone system AMPS-Concepts of digital cellular system-USDC (IS-54)-GSM-GSM architecture-GSM radio subsystem-service and security aspects-frame structure

5. Modern wireless communication systems: GPRS-EDGE-DECT-WLL-3G mobile phone system-4G aspects-salient features

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 Cellular Telecommunications-Analog and Digital systems by Willium C. Y. Lee, McGrawHill
4. Mobile Communications by Jochen Schiller, PEARSON

Advanced Micro Controllers & DSP

Subject title : Advanced Micro Controllers & DSP

Subject code : EC-605

Periods per week : 04

Periods / Semester : 60

Rationale: The course Advanced microcontrollers &DSP is introduced in the VI semester keeping in view the vast developments in the field of microcontrollers. This helps the students to get good job opportunities and have them an edge over others .

TIME SCHEDULE

Sl	Major Topics	Periods	Weightage of Marks	Short Type	Essay Type
1	PIC MICRO CONTROLLERS	15	29	3	2
2	MCS-96 MICROCONTROLLERS	15	26	2	2
3	ARM MICRO CONTROLLERS	12	23	1	2
4	INTRODUCTION TO DSP PROCESSORS	18	32	4	2
5	Introduction to embedded systems and RTOS				
	TOTAL	**60**	**110**	**10**	**8**

OBJECTIVE:

1.0 Introduction to PIC micro controller

1.1 Study about PIC micro controller family
1.2 Explain PIC16F8XX and PIC16CX/7X families
1.3 Explain PIC16F877
1.4 Explain Features of PIC16F877
1.5 Familiarize Pin diagram of PIC16F877
1.6 Explain Block diagram of PIC16F877
1.7 Explain Instruction Set of PIC16F877
1.8 Explain Memory Organization of PIC16F877
1.9 Explain External Interfacing to PIC Microcontrollers
1.10 List any 5 Applications of PIC Micro Controller.

2.0 Explain MCS- XX family

2.1 Explain MCS – 96 Microcontrollers
2.2 List Important Features of MCS – 96 Microcontrollers
2.3 Familiarize Pin Diagram of MCS – 96 Microcontrollers
2.4 Explain Internal Architecture of MCS – 96 Microcontrollers
2.5 Explain Memory Map of MCS – 96 Microcontrollers
2.6 Explain addressing Modes of MCS – 96 Microcontrollers
2.7 Explain Instruction set of MCS – 96 Microcontrollers
2.8 Explain Interfacing of External Memory to 96 Microcontrollers
2.9 Explain Interfacing External Devices(ADC/RTC) to 96 Microcontrollers.
2.10 Explain the use 0f 16 Bit microcontrollers in AUTOMOTIVE Engineering (CAN)

3.0 Introduction to ARM Microcontrollers

3.1 Explain the RISC Concept
3.2 Compare LIS and RISC Architecture
3.3 Explain ARM Core Architecture,
3.4 List 5 Important Features of ARM
3.5 Compare the Different versions of ARM
3.6 Explain Architecture of
3.7 Explain Memory Map of ARM
3.8 Explain Addressing Modes ARM

3.1 List Instruction set of ARM
3.2 4.2.Explian Arithmetic instructions
a. Explain Conditional Instructions
b.
3.3 4.2.2 Explain Registers of ARM Processors
3.4 Explin the concept of Pipelining in ARM processors

3.9

3.10 List the 4 application of various versions of ARM

4.0 Introduction to programmable DSPs

4.1 Explain Multiplier and Multiplier Accumulator (MAC)
4.2 Define Modified Bus Structures and Explain.
4.3 Explain Memory Access schemes in DSPs
4.4 Explain multiple access memory, multiport memory
4.5 Explain VLSI Architecture of DSPs
4.6 Explain Special addressing modes
4.7 Define On-Chip Peripherals and list them.
4.8 List versions of TMS 320C5X family
4.9 Explain Architectural block diagram of TMS 320C5X
4.10 Explain Bus Structure of TMS 320C5X
4.11 Explain Central Arithmetic Logic Unit with diagram
4.12 Explain Auxiliary Registers
4.13 Explain Index Register
4.14 Explain Auxiliary Register Compare Register
4.15 Explain Block Move Address Register
4.16 Explain Parallel Logic Unit
4.17 Explain Memory mapped registers
4.18 Explain program controller with sketches
4.19 List important flags in the status registers of TMS 320C5X

5.0 Introduction to Embedded System

5.1 Explain Embedded System
5.2 Compare Embedded System and General Computing System
5.3 List five Application areas of Embedded System
5.4 Draw general block diagram of an embedded system
5.5 Explain Core of the Embedded System
5.6 Explain Memory management .
5.7 Explain Embedded Firm ware
5.8 Explain Communication Interface
5.9 Explain Operating System Basics
5.10 Explain Tasks, Process and Threads
5.11 Define Multi Processing and Multi Tasking
5.12 Explain Real Time Operating System
5.13 Compare Normal OS and RTOS.
5.14 List three Types of. RTOS
5.15 Explain basics of VXworks RTOS.

CONTENTS

1. **PIC MICRO CONTROLLER :** Introduction and Evolution of PIC family, Introduction to PIC16F8XX and PIC16CX/7X, Features of PIC16F877, Pin and Block diagram of

PIC16F877, Instruction Set and Memory Organization of PIC16F877 and Applications of PIC Micro Controller.

2. **ADVANCED MICROCONTROLLERS:** MCS –XX family, MCS – 96 Microcontrollers: Important Features, Pin Diagram, Internal Architecture, Memory Map, Addressing Modes, Instruction set.

3. **ARM MICROCONTROLLERS:** ARM Microcontrollers: ARM Core Architecture, Versions of ARM, Memory Map, Addressing Modes, Instruction set and Important Features.

4. **INTRODUCTION TO DSP PROCESSORS:** Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory, Multiport memory, VLSI Architecture, Pipelining, Special addressing modes, On-Chip Peripherals. Architecture of TMS 320C5X- Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Registrar, Index Registrar, Auxiliary Register Compare Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers

5. **INTRODUCTION TO EMBEDDED SYSTEM AND RTOS :**Introduction, embedded system vs General computing system, classification and applications, Typical Embedded System-Core Memory, Communication Interface, Firmware
   Real Time Operating System: Operating System basics, Types of OS, Tasks, Process, Threads, Multiprocessing and Multitasking, Types

REFERENCES:

1. **Microcontroller Programming**: The Microchip **PIC By Julio Sanchez, Maria P. Canton CRC Press**
2. **Advanced Microprocessor And Microcontrollers By B.P. Singh, New age International Publcations**
3. Micro Processors and Micro Controllers- M.Senthil Kumar, M.Saravanan and S.Jeevanathan Oxford University Press, 1st Edn, 2010
4. Microcontrollers-Deshmukh, Tata Mc-Graw Hill Edition, 2004.
5. Microcontrollers Theory and Applications -Deshmukh, Tata Mc-Graw Hill Edition, 2005.
6. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

7. DIGITAL CIRCUIT DESIGN THROUGH VERILOG HDL

Subject title : DIGITAL CIRCUIT DESIGN THROUGH VERILOG HDL

Subject code : EC-606

Periods per week : 04

Periods / Semester : 60

Rationale: The course Digital Circuit Design Through Verilog HDL is introduced in the VI semester keeping in view the vast developments in the field of VLSI Circuits. to helps the students get good job opportunities and have them an edge over others .

TIME SCHEDULE

Sl	Major Topics	Periods	Weightage of Marks	Short Type	Essay Type
1	Basic Concepts of Verilog HDL	15	19	3	1
2	Gate Level, Data flow and Behavioral Modeling	16	29	3	2
3	Modeling of Combinational Logic Circuits	15	26	2	2
4	Modeling of Sequential Logic Circuits	10	26	2	2
5	System design concepts	4	10	-	1
	TOTAL	**60**	**110**	**10**	**8**

OBJECTIVES : On completion of the course the student will be able to

I. Basic Concepts of VLSI Circuits

1.1 Explain the process MOS Transistor fabrication
1.2 List the merits of CMOS technology
1.3 Explain CMOS fabrication process
1.4 List Layout design rules
1.5 Explain layout design rules
1.6 Explain stick diagrams Explain VLSI design flow
1.7 Explain VLSI design specification and design entry
1.8 Explain functional simulation
1.9 Explain Planning placement and Routing (PPR)
1.10 Explain timing simulation
1.11 Explain Fusing/Fabrication into the chip.
1.12 Explain the use of of Verilog VHDL in VLSI simulation

2.0 Understand Design flow for designing VLSI IC and concepts of Verilog HDL

2.1. Explain the steps involved in the design flow for the VLSI IC design
2.2. Explain the importance of Hardware Description Languages in VLSI design
2.3. Compare VHDL and Verilog HDL
2.4. List the features of Verilog HDL
2.5. Explain the difference between an instantiation and inference of a component.
2.6. Explain differences between modules and module instances in Verilog.
2.7. Explain four levels of abstraction to represent the internals of a module
2.8. Identify the components of a Verilog module definition
2.9. Explain the port connection rules in a module instantiation
2.10. Explain the lexical conventions like number specification, Identifiers keywords, etc
2.11. Explain different data types like value set, nets, registers, vectors, integer, real and time register data types, arrays, memories and strings.
2.12. Explain defparam and localparam keywords
2.13. Explain about system tasks and compiler directives
2.14. Define expressions, operators and operands.
2.15. Explain all types of operators used in the Verilog HDL

2.0 Analyze concepts of Gate level, Data Flow and Behavioral modeling

2.1 Identify the logic gate primitives provided in Verilog
2.2 Explain the instantiation of gates, gate symbols, and truth tables for and/or and buf/not type gates.
2.3 Explain rise, fall and turn-off delays in the gate level design

2.4 Explain about the *initial* and *always* statements.
2.5 Explain the assignment statements in data flow modeling
2.6 Explain different types of delays used in the data flow level modeling
2.7 Explain blocking and nonblocking procedural assignments with examples
2.8 Explain about timing controls like delay based timing control and event based timing control.
2.9 Explain conditional statements.
2.10 Explain multiway branching - use case, casex and casez statements.
2.11 Explain the difference between conditional if statement and case statements.
2.12 Explain looping statements such as while, for, repeat, and forever.
2.13 Explain sequential and parallel blocks.
2.14 Explain about User Defined Primitives(UDP)
2.15 Explain about the hierarchical modeling,
2.16 List the advantages of hierarchical modeling
2.17 Explain about modeling techniques in Verilog HDL.
2.18 Design simple logic circuits like adders, subtractors using Behavioral, Data
2.19 Flow and Structural modeling.

3.0 Design Verilog Modeling of Combinational and Sequential Circuits

3.1 Design combinational circuits like multiplexers, decoders, encoders, Comparators and ALU
3.2 Design RS, JK, T and D flip flops with Asynchronous and Synchronous Clock and reset
3.3 Explain implementation of shift registers like SISO, SIPO, PISO, PIPO, etc.
3.4 Design synchronous and asynchronous counters
3.5 Design a divide by 3 counter
3.6 Design shift register counters like ring counter, etc.
3.7 Design memories like RAM and ROM.
3.8 Compare RTL level and structural level modelings.

Note: Use three levels of modelings (behavioral, dataflow and gate level) for the above designs.

4.0 Apply Functional verification and Testing of Verilog modules.

4.1 Define test bench module.
4.2 Explain the need of a stimulus module.
4.3 Explain the structure of stimulus module.
4.4 Apply the stimulus modules for combinational and sequential circuits of Verilog designs.
4.5 Explain the concept of Finite State Machines.
4.6 Explain the Mealy and Moore types of State Machines.
4.7 Solve simple problems on Mealy and Moore state machines.
4.8 Explain the Design of Mealy above state machine using Verilog HDL.

5.0 Analyze the system design concepts

5.1 Explain various design tools which are useful in different stages of design
5.2 List 4 important programmable logic devices
5.3 Explain the architecture of PLAs
5.4 Explain the architecture of PALs

5.5 Explain the architecture of CNLD
5.6 Explain the architecture of FPGAs,
5.7 Compare above devices
5.8 List any 3 applications of above devices
5.9 Explain the design of UART using FPGA board
5.10 Explain the design of Traffic Light controller using FPGA board

REFERENCE BOOKS:

1. Digital systems design by Morris Mano
2. Verilog HDL: A guide to digital design and synthesis by S. Palnitkar
3. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, IEEE Press, 2004.
4. Fundamentals of Logic Design with Verilog – Stephen. Brown and Zvonko Vranesic, TMH, 2005.

INDUSTRIAL ELECTRONICS LABORATORY PRACTICE

Subject Title : INDUSTRIAL ELECTRONICS LABORATRY PRACTICE
Subject Code : EC-607
Periods/Week : 04

Periods/Semester : 90

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	Weightage of Marks	Short Type	Essay Type
1	Power devices	15	19	3	1
2	UJT Circuits	16	29	3	2
3	Power control Techniques	15	26	2	2
4	Inverter & Servo Stabilzers	10	26	2	2
5	Sensors and Transducers	4	10	-	1
6	PLC				
	TOTAL	**60**	**110**	**10**	**8**

I. Power devices

1. To Identify Power Semiconductor devices SCR, TRIAC, DIAC,, SUS SBS, MOSFET, IGBT, LASCR, UJT, HEATSINKS, OPTO COUPLERS MCT2E, MOC 3011 .

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. 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
    c)

II. UJT Circuits

4. To plot the characteristics and determine the intrinsic standoff ratio of UJT
5. To construct UJT Relaxation oscillator circuit and observe the output waveforms on CRO

III. Power control

6. To Trigger the SCR by UJT and control output Power

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

8. To implement 100 watt 230V AC Lamp Control circuit using Optocoupler MOC3011 and 4Amps TRIAC.
9. To 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. Inverter , Servo Stabilizers&CVTs

10. To implement a square wave inverter circuit with centre tapped transformer ,power MOSFETS and Plot regulation characteristics.
11. To Vary the speed of a small DC motor using pulse width modulation
12. To draw the regulation characteristics of servo stabilizer
13. To assemble a servo Stabilizer and test.
14. To plot the Regulation characteristics of Constant Voltage Transformer.

V, Transducers

15. To draw the performance characteristics of LVDT
16. To plot the performance characteristics of Thermocouple
17. To draw the performance characteristics of RTD
18. To measure the temperature using IC LM 335
19. To implement an ON/OFF temperature controller using IC LM335
20. To draw the characteristics of Load cell

VI. **Programmable Logic Controllers**

21. To get familiarized with PLC tutor or PSIM
22. Using the PLCs to build basic logic gates
    a) To implement basic gates using PLC
    b) To implement XOR , XNOR gates using PLC
23. To implement delay timers using PLC
24. To implement on timer and off timer using PLC
25. To implement up counter and down counter
26. To implement start/Stop Motor control
27. To implement Two way switch control
28. To implement sequential motor control (3 Motors) with a delay
29. To implement Motor forward and reverse direction control.
30. To implement a Traffic Light controller

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 applications from the data sheet	➢ 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 applications from the data sheet ➢
2	To plot the characteristics of MOSFET and determine	➢ Identify MOSFET and its package	➢ Identify MOSFET and its package

	gate source threshold voltage a)To implement a MOSFET switch and control a 6V lamp using NAND Gate .(3)	➢Interpret specifications from datasheets ➢Test the MOSFET using digital multimeter. ➢Rig up the circuit ➢Interface with TTL Gates	➢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 ➢Determine intrinsic standoff Ratio	➢Rig up the circuit ➢Test the UJT using digital multimeter. ➢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	➢ Rig up the circuit ➢Test he circuit ➢Observe the UJT Trigger	➢Test he circuit ➢Observe the UJT Trigger waveform on

	Power .(3)	waveform on CRO ➢ Observe & Measure the load Voltage on CRO ➢ Observe the effect of changing RC Values	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 ➢ Test the inverter on Load	➢Identify the parts ➢Assemble the parts ➢Make Electrical connections ➢Connect to the battery ➢Observe polarity ➢ 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 correction	➢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
14	To plot the Regulation characteristics of Constant Voltage Transformer. .(3)	➢Identify CVT and its terminals ➢Make Electrical connections ➢Connect variable lamp load ➢Apply variable input	➢Identify CVT and its terminals ➢Make Electrical connections ➢Connect variable lamp load ➢Apply variable input

		voltage using Auto Transformer ➢ Measure output voltage	voltage using Auto Transformer ➢ Measure output voltage
15	To draw the performance characteristics of LVDT.(3)	➢ Identify LVDT ➢ Connect the set up ➢ Carefully Change the LVDT core position and measure transducer output in steps	➢ Identify LVDT ➢ Connect the set up Carefully Change the LVDT core position and measure transducer output in steps
16	To plot the performance characteristics of Thermocouple transducer.(3)	➢ Identify Thermocouple transducer ➢ Prepare experimental set up ➢ Increase the temperature in steps ➢ Measure the output voltage	➢ Identify Thermocouple transducer ➢ Prepare experimental set up ➢ Increase the temperature in steps Measure the output voltage
17	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
18	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
19	To implement an ON /OFF temperature controller using IC LM335 .(3)	➢ Identify and select the components ➢ Identify the terminals of LM 335 ➢ Rig up the circuit ➢ Connect the relay board ➢ Apply heat and set the cut off temperature ➢ Test over designed Temperature Range	➢ Identify and select the components ➢ Identify the terminals of LM 335 ➢ Rig up the circuit ➢ Connect the relay board ➢ Apply heat and set the cut off temperature ➢ Test over designed Temperature Range

20	To draw the characteristics of Load cell.(3)	➢Identify Load cell transducer ➢Prepare experimental set up ➢Increase the Load in steps ➢Measure the output voltage	➢Identify Load cell transducer ➢Prepare experimental set up ➢Increase the Load in steps Measure the output voltage
PART B – PLC Experiments/Simulation			
21	To get familiarized with PLC tutor or PSIM.(3)	➢Identify the PLC ➢Note down the manufacturer's details ➢Get acquainted with symbols and ladder diagrams ➢Identify the sections of PSIM GUI	➢Identify the PLC ➢Note down the manufacturer's details ➢Get acquainted with symbols and ladder diagrams Identify the sections of PSIM GUI
22	Using the PLCs to build basic logic gates To implement basic gates using PLC To implement XOR XNOR gates using PLC.(3)	➢ Implement the circuit Using PSIM ➢Verify the truth tables of Logic Gates ➢Verify the truth table of XOR &XNOR Gates	➢Implement the circuit Using PSIM ➢Verify the truth tables of Logic Gates Verify the truth table of XOR &XNOR Gates
23	To implement delay timers using PLC.(3)	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify
24	To implement on timer and off timer using PLC.(3)	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify
25	To implement up counter and down counter.(3)	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify

26	To implement start/Stop Motor control.(3)	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify
27	To implement Two way switch control.(3)	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify
28	To implement sequential motor control Motors with a delay(3)	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify	➢Develop Ladder diagram ➢Implement Using PSIM Simulate and verify
29	To implement Motor forward and reverse direction control. .(3)	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify	➢Develop Ladder diagram ➢Implement Using PSIM Simulate and verify
30	To implement a Traffic Light controller.(3)	➢Develop Ladder diagram ➢Implement Using PSIM ➢Simulate and verify	➢Develop Ladder diagram ➢Implement Using PSIM Simulate and verify

Verilog HDL lab Practice

Subject title : Verilog HDL lab Practice

Subject code : EC-608

Periods per week : 3

Periods / Semester : 45

Rationale: This laboratory course is Included to reinforce and practically verify the theoretical inputs learnt in the theory part of this semester without losing the contiguity. Further this course also helps the students to experiment with latest tools used in the VLSI

Circuit design which gives the students an edge over others .

TIME SCHEDULE

Sl	Major Topics	Periods	Weightage of Marks	Short Type	Essay Type
1	implementing basic logic gates	15	19	3	1
2	Combinational circuits	16	29	3	2
3	Sequential circuits	15	26	2	2
4	Registers	10	26	2	2
5	Counters	4	10	-	1
	TOTAL	**60**	**110**	**10**	**8**

List of Experiments

1. To Familiarize with MultiSIm simulation software for verilog HDL
2. To implement Basic Logic Gates
3. To implement i) Half adder and ii) Full Adder
4. To implement i) Half Subtractor and ii) Full Subtractor
5. To implement 4-bit Parallel Adder
6. To implement 4:1 Multiplexers
7. To implement 1:4 Demultiplexers
8. To implement 3:8 Decoders
9. To implement 8:3 Encoders
10. To implement 4-bit Comparator
11. To implement SR-Flip flop
12. To implement) JK- Flip Flop
13. To implement D- Flip Flop)
14. To implement i) SISO ii) SIPO Shift Registers
15. To implement a Decimal counter

Competencies and Key Competencies to be achieved

Exp no	Name of the experiment (NO of Periods)	Competencies	Key competencies
1	To Familiarize with Multi SIm simulation software for verilog HDL (3)	➢Familiarize with MultiSim Interface ➢Create a directory for the project ➢Start ModelSim and create a new project ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢Start the simulation ➢Add signals to the wave window ➢Recompile changed verilog files ➢Restart/Run the simulation	➢Familiarize with MultiSim Interface ➢Create a directory for the project ➢Start ModelSim and create a new project ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢Start the simulation ➢Add signals to the wave window ➢Recompile changed verilog files ➢Restart/Run the simulation
2	To implement Basic Logic	➢Create a directory for the project	➢Create a directory for the project

	Gates (3)	➢Start ModelSim and create a new project ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢Start the simulation ➢Add signals to the wave window ➢Recompile changed verilog files ➢Restart/Run the simulation	➢Start ModelSim and create a new project ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢Start the simulation ➢Add signals to the wave window ➢Recompile changed verilog files ➢Restart/Run the simulation
3	To implement i) Half adder and ii) Full Adder (3)	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢Start the simulation ➢Add signals to the wave window ➢Recompile changed verilog files ➢	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢Start the simulation ➢Add signals to the wave window ➢Recompile changed verilog files
4	To implement i) Half Subtractor and ii) Full Subtractor (3)	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate
5	To implement 4-bit Parallel Adder (3)	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate
6	To implement 4:1 Multiplexers (3)	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog

		➢simulate	files ➢simulate
7	To implement 1:8 Demultiplexer (3)	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate
8	To implement 3:8 Decoder **(3)**	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate
9	To implement 8:3 Encoder **(3)**	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate
10	To implement 4-bit Comparator **(3)**	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate
11	To implement SR-Flip flop **(3)**	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate
12	To implement JK Flip Flop	➢Design the logic ➢Enter the code	➢Design the logic ➢Enter the code

	(3)	➢Add verilog file to the project ➢Compile your verilog files ➢simulate	➢Add verilog file to the project ➢Compile your verilog files ➢simulate
13	To implement D Flip Flop **(3)**	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate
14	To implement i) SISO ii) SIPO Shift Register **(3)**	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate
15	**To implement a Decimal counter (3)**	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate	➢Design the logic ➢Enter the code ➢Add verilog file to the project ➢Compile your verilog files ➢simulate

Tools Required:

Xilinx ISE 9.2i simulator and Modelsim Software

i

Advanced Micro Controllers Lab Practice

Subject title : Advanced Micro Controllers Lab Practice

Subject code : EC-609

Periods per week : 4

Periods / Semester : 60

Rationale: This laboratory course is Included to reinforce and practically verify the theoretical inputs learnt in the theory part of this semester without losing the contiguity. Further this course also helps the students to experiment with Advanced Microcontrollers like ARM which gives the students an edge over others and better employment opportunities.

TIME SCHEDULE

Sl	Major Topics	Periods	Weightage of Marks	Short Type	Essay Type
1	Programming PIC Controller for data processing	15	19	3	1
2	Interfacing DAC	16	29	3	2
3	Interfacing Sensors & ADC	15	26	2	2
4	Programming ARM Controllers	10	26	2	2
	TOTAL	**60**	**110**	**10**	**8**

LIST OF EXPERIMENTS

1. Write C PROGRAM FOR PIC16F877to add two 16-bit operands

2. Write C PROGRAM FOR PIC16F877to add two 32-bit operands

3. Write C PROGRAM FOR PIC16F877to subtract two 16-bit operands

4. Write C PROGRAM FOR PIC16F877to multiply two operands

5. Write C PROGRAM to generate a Square wave by interfacing 8-bit bipolar DAC with PIC16F877

6. Write C PROGRAM to generate a Sine wave by interfacing 8-bit bipolar DAC with PIC16F877

7. Write C PROGRAM to interface ADC module with PIC16F877

14. Write C PROGRAM to generate PWM by interfacing ADC module with PIC16F877

8. Write C PROGRAM to design a digital thermometer to display the temperature in ^{0}C using PIC16C71

9. Write C PROGRAM to design a LVDT interfacing with PIC16C71 using AD698

10 Write C PROGRAM to add two 16-bit operands using ARM controller

11. Write C PROGRAM to add two 32-bit operands using ARM controller

12. Write C PROGRAM to subtract two 16-bit operands using ARM controller

13. Write C PROGRAM to multiply two operands using ARM controller

14.Write C Progran to generate a triangular WAVE using the ARM Controller

15. Write a C program to Sample a Sine wave at 1000 Samples/second and store

The samples in memory using ARM Processor and ADC

Competencies and Key Competencies to be achieved

Exp No	Name of the Experiment	Competencies	Key Competencies
1	Write C PROGRAM FOR PIC16F877to add two 16-bit operands	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result

2	. Write C PROGRAM FOR PIC16F877to add two 32-bit operands3.	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
3	Write C PROGRAM FOR PIC16F877to subtract two 16-bit operands	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
4	Write C PROGRAM FOR PIC16F877to multiply two operands	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
5	Write C PROGRAM to generate a Square wave by interfacing 8-bit bipolar DAC with PIC16F877	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Observe the Waveform using CRO	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
6	6. Write C PROGRAM to generate a Sine wave by interfacing 8-bit bipolar DAC with PIC16F877	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Observe the Waveform using CRO	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
7	Write C PROGRAM to interface ADC module with PIC16F877 .Use a Variable Analog TEST Signal Observe the readings on DIGITAL DISPLAY INTERFACE	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Tabulate the readings	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
8	8. Write C PROGRAM to design a digital thermometer to display the temperature in ^{0}C using PIC16C71 and Digital Display Unit	➢ Enter the Program in Editor ➢ RIG Up The Circuit ➢ Compile and Execute	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result

9	Write C PROGRAM to design a LVDT interfacing with PIC16C71 using AD698. And observe the readings on Digital Display Unit	➢ Enter the Program in Editor ➢ Rig up the circuit ➢ Compute and Execute	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
10	Write C PROGRAM to add two 16-bit operands using ARM controller	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
11	Write C PROGRAM to add two 32-bit operands using ARM controller	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
12	Write C PROGRAM to subtract two 16-bit operands using ARM controller	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
13	Write C PROGRAM to multiply two operands using ARM controller	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
14	.Write C Program to generate a triangular WAVE using the ARM Controller	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Observe the Waveform using CRO	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result
15	Write a C program to Sample a Sine wave at 1000 Samples/second and store in simulator Memory	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Tabulate the Readings	➢ Enter the Program in Editor ➢ Compile and Execute ➢ Verify the Result

Subject Title	**:**	**Project Work**
Subject Code	**:**	**EC- 610**
Periods / Week	**:**	**06**
Periods / Semester	**:**	**90**

OBJECTIVES

On completion of the subject duration the student should be able to perform the following

1.0 Project work

1.1 Identifies different works to be carried out in the Project.

1.2 Collects data relevant to the project work.

1.3 Carry out need survey.

1.4 Select the most efficient method from the available choices based on preliminary investigation.

1.5 Design the required elements of the project work as per standard practices.

1.6 Prepares the working modules / equipments required for the project work.

1.7 Estimates the cost of project, technological need, computer skills, materials and other equipments.

1.8 Prepares the plan and schedule of starting time and sequence of operations to be carried out at the various stages of the project work in detail.

1.9 Preparation of critical activities at the various stages of the project work.

1.10 Tests to be carried at various conditions with different electrical input parameter if required.

1.11 To implementation of project work and recording the results at various places.

1.12. Collects the necessary information to procure necessary finance, and equipment.

1.13 Preparation of the chart or model for each of the project.

1.14 Preparation of project report.

2.0 Report on observations in Industrial visits

2.1 Visit nearby electronics/communication engineering industries

COURSE CONTENT

Project work is intended to provide training in the solution of various fields of engineering problems relating to

Rural Communication Systems: Connection remotely scattered hamlets with wireless technology.

Energy Saving Equipments: Replacing of Tungsten filament lamps with effective To implementation of LED, CFL Lamps at various applications.

Automobile Field: Solar Operated Vehicles, Battery Operated Vehicles with remote Operated electrical Devices involving power control with wireless technology.

Embedded Systems: Various applications in industry involving the microcontrollers for automation and efficient supervision of the systems.

Power Devices: Inverter, SCR based applications, UPS and Automatic switching DG Sets etc.

Project work will also include the To implementation of Innovative Ideas which improves the nation growth and preparation of the feasibility report for any one type of enterprise under self – employment schemes also.

Students shall be divided into groups of five each and shall be assigned a problem that calls for application of the Explainledge he/she acquired in the course and also which involves some extra study of reference materials.

Every student should prepare a project report and submit the same for assessment. Every student puts his share to the work in all the operations of the project. The end examination in Project work shall consist of power point presentation and Viva-voce test to be assessed by a panel of examiners comprising of an External examiner, the Head of Section, and member of staff who guided the project as Internal examiner.

Scheme of assessment

1)	Seminar	-	20 Marks
2)	Internal assessment	-	20 Marks
3)	Power point presentation, Report & Viva-Voce (3x20)	-	60 Marks
	Total Marks	-	100