DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING
C-16, SCHEME OF INSTRUCTIONS AND EXAMINATIONS
FIRST SEMESTER

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:								
EE-105	Electrical Engineering Materials-1	4	-	60	3	20	80	100
EE-106	Basic Electrical Engineering-1	4	-	60	3	20	80	100
PRACTICAL:								
EE-108	Basic Electrical Work Shop Practice-1	-	6	90	3	40	60	100
TOTAL								

English for Polytechnics

(Common to All the Branches)

First Semester

Subject Code : EE-101
No. of periods per week : 3
No. of periods per year : 45

Objectives and Key Competencies

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

		• Appreciate a humorous narrative	• Learn new vocabulary • Complete a story
08	**Tiller Turns Engineer – An Innovation**	• Read and understand the main idea • Improve your vocabulary	• Focus on minute details • Develop innovative skills • Present one's view
09	**The Present Tense- I**	• Differentiate between time and tense • Describe habits and facts	• Learn the three broad categories of tense • Learn the action words and auxiliary words • Learn the simple present tense structure • Talk about routine, habits and facts • Make negative sentences
10	**The Present Tense- II**	• Describe the actions happening in the present • Describe past actions as relevant to the present	• Express the actions happening in the present • Express the actions that have been completed in the recent past • Make sentences in the present perfect continuous tense
11	**The Past Tense- I**	• Understand what irregular verbs are • Describe actions which took place in the past	• Learn the irregular verbs • Narrate the stories or incidents in simple past tense
12	**The Past Tense- II**	• Describe an action that was happening in the past • Describe a past action that took place before another past action	• Describe the actions in progress in the past • Use past perfect tense
13	**The Future Tense**	• Describe future actions • Understand various aspects of future tense	• Express the actions that are going to happen in the future • Know the uses of the modals
14	**Basic Sentence Structures- I**	• Understand basic sentence structures • Use basic sentence structures in spoken and in written forms • Identify common errors in the usage of basic sentence structures	• Learn how English is different from Indian Languages from structures point of view • Learn intransitive verbs • Use Subject +Verb structure • Use Subject + Verb + Subject Complement structure
15	**Basic Sentence**	• Understand basic sentence structures	• Learn transitive verbs which are followed by only one object

	Structures- II	• Form basic sentence structures	• Learn transitive verbs which are followed by two objects • Identify the structures • Use Object complement structure
16	**Voice – I**	• Identify and use the passive voice • Know when the passive voice is used • Use the passive voice	• Learn when to use the active voice and passive voice • Observe the language used in sign boards and newspaper headlines • Change the voice
17	**Voice – II**	• Identify the two objects of a verb • Omit the object in a passive voice sentence	• Change the voice when two objects are given
18	**Asking Yes/No Questions**	• Understand the word order in questions • Ask yes/no questions	• Communicate using yes/no questions • Invert the position of helping verb to make questions • Know the common errors in framing questions
19	**Asking Wh-Questions**	• Frame wh- questions • Seek information using such questions	• Learn wh- words • Ask for specific information using wh- questions
20	**Paragraph Writing – I**	• Generate ideas for writing a paragraph • Organize ideas before writing • Write a short paragraph	• Write a paragraph using hints • Organize the ideas • Write the rough draft • Edit the paragraph to make final copy
21	**Paragraph Writing – II**	• Identify a topic sentence • Write a cohesive paragraph • Write supporting sentences	• Write a short paragraph using the first sentence • Learn a few ways of beginning paragraph • Write a few supporting sentences • Write a short paragraph
22	**Letter Writing – I**	• Understand the format of a personal letter • Write a personal letter	• Learn the main components (the format) of a personal letter • Practise a few ways of greetings, openings and closures • Write a personal letter
23	**Letter Writing - II**	• Understand the format of an official letter	• Know the format of official letters • Learn the expressions often used in

	• Write an official letter	official letters • Write an official letter using the hints

Weightage Table

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

ENGINEERING MATHEMATICS - I

(Common to all branches)

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

Time Schedule with BLUEPRINT

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

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

ENGINEERING MATHEMATICS – I

COMMON TO ALL BRANCHES – 102

Objectives

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

UNIT – I

Algebra

1.0 Use Logarithms in engineering calculations

1.1 Define logarithm and list its properties.

1.2 Distinguish natural logarithms and common logarithms.

1.3 Explain the meaning of e and exponential function.

1.4 State logarithm as a function and its graphical representation.

1.5 Use the logarithms in engineering calculations.

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

2.1 Define the following fractions of polynomials:

1. Rational,
2. Proper
3. Improper

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

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

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

3.0 Use Matrices for solving engineering problems

3.1 Define a matrix and order of a matrix.

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

3.3 Compute sum, scalar multiplication and product of matrices.

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

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

3.6 Define symmetric and skew-symmetric matrices.

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

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

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

3.10 Distinguish singular and non-singular matrices.

3.11 Apply the properties of determinants to solve problems.

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

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

3.14 Compute adjoint and multiplicative inverse of a square matrix.

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

3.16 State elementary row operations.

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

UNIT – II

Trigonometry:

4.0 Solve simple problems on Compound Angles

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

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

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

4.4 Solve simple problems on compound angles.

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

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

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

5.3 Solve simple problems using the above formulae

6.0 Apply Transformations for solving the problems in Trigonometry

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

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

7.0 Use Inverse Trigonometric Functions for solving engineering problems

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

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

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

7.4 State various properties of inverse trigonometric functions and identities like

$\sin^{-1}x + \cos^{-1} x = \frac{\pi}{2}$ etc.

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

8.0 Appreciate Properties of triangles

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

9.0 Represent the Hyperbolic Functions in terms of logarithm functions

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

9.2 Represent inverse hyperbolic functions in terms of logarithms.

10.0 Represent Complex numbers in various forms

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

10.2 Define the operations on complex numbers with examples.

10.3 Define amplitude of a complex number

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

COURSE CONTENT

Unit-I

Algebra

1. Logarithms:

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

2. Partial Fractions:

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

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

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

Matrices:

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

Unit-II

Trigonometry:

4. Compound angles: Formulas of sin (A±B), cos (A±B), tan (A±B), cot (A±B) and related identities with problems.
5. Multiple and sub-multiple angles: trigonometric ratios of multiple angles 2A, 3A and submultiple angle A/2 with problems.
6. Transformations of products into sums or differences and vice versa simple problems
7. Inverse trigonometric functions: definition, domains and ranges-basic properties-problems.
8. Properties of triangles: relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule – statements only.

9. Hyperbolic functions: Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.
10. Complex Numbers: Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitude (polar) form, Exponential (Euler) form of a complex number- Problems.

Reference Books:

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

ENGINEERING PHYSICS-I

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

TIME SCHEDULE

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

INTERNAL ASSESSMENT

UNIT TEST 1 : UNITS 1,2 and 3

UNIT TEST 2 : UNITS 4 and 5

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Units and dimensions

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

2.0 Understand the concept of Modern physics

2.1 Explain Photo-electric effect
2.2 Write Einstein's photoelectric equation
2.3 State the laws of photoelectric effect
2.4 Explain the Working of a photoelectric cell
2.5 List the Applications of photoelectric effect
2.6 Recapitulate refraction of light and its laws

2.7 Define critical angle
2.8 Explain the Total Internal Reflection
2.9 Explain the basic principle of optical Fiber
2.10 Mention types of optical fibbers
2.11 List the applications of optical Fiber
2.12 Define super conductor and superconductivity
2.13 List the examples of superconducting materials
2.14 List the applications of superconductors

3.0 Understand the concept of Heat and thermodynamics

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

4.0 Understand the concept of Elements of Vectors

4.1 Explain the concept of Vectors
4.2 Define Scalar and Vector quantities
4.3 Give examples for scalar and vector quantities
4.4 Represent a vector graphically
4.5 Classify the Types of Vectors
4.6 Resolve the vectors
4.7 Determine the Resultant of a vector by component method
4.8 Represent a vector in space using unit vectors (i, j, k)
4.9 State triangle law of addition of vectors
4.10 State parallelogram law of addition of vectors
4.11 Illustrate parallelogram law of vectors in case of flying bird and sling.
4.12 Derive an expression for magnitude and direction of resultant of two vectors
4.13 State polygon law of addition of vectors
4.14 Explain subtraction of vectors
4.15 Define Dot product of two vectors with examples (Work done, Power)
4.16 Mention the properties of Dot product
4.17 Define Cross products of two vectors and state formulae for torque and linear velocity
4.18 Mention the properties of Cross product.
4.19 Solve the related numerical problems

5.0 Understand the concept of Kinematics

5.1 Write the equations of motion in a straight line
5.2 Explain the acceleration due to gravity

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

COURSE CONTENT

1. Units and Dimensions:

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

2. Modern Physics;

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

3. Heat and Thermodynamics:

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

4. Elements of Vectors:

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

5. Kinematics:

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

REFERENCE BOOKS

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

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES - I

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

TIMESCHEDULE

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

OBJECTIVES

Upon completion of the course the student shall be able to

A. ENGINEERINGCHEMISTRY

1.0 Fundamentals of Chemistry

1.1 Explain the fundamental particles of an atom like electron, proton and neutron etc.,

1.2 Explain the concept of atomic number and mass number

1.3 State the Postulates of Bohr's at omic theory and its limitations

1.4 Explain the concept of Quantum numbers with examples

1.5 Explain 1.Aufbau'sprinciple, 2.Hund'sruleand 3.Pauli'sexclusion principle with examples.

1.6 Define Orbital.

1.7 Draw the shapes of s,pandd Orbitals.

1.8 Distinguish between Orbitand Orbital

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

1.10 Define chemical bond.

1.11 Explain the Postulates of Electronic theory of valancy

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

1.13 Explain bond formation in NaClandMgO

1.14 List the Properties of Ionic compounds

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

1.16 List the Properties of Covalent compounds

1.17 Distinguish between ionic compounds and covalent compounds.

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

1.19 Calculate the Oxidation Number

1.20 Differentiate between Oxidation Number and Valency.

2.0 Solutions

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

2.2 Classify solutions based on physical state.

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

2.4 Define mole.

2.5 Explain Mole concept with examples.'

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

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

2.8 Define 1.Molarity and Normality.

2.9 Solve Numerical problems on Mole, Molarity and Normality

3.0 Acids and bases

3.1 Explain Arrhenius theory of Acids and Bases

3.2 State the limitations of Arrhenius theory of Acid sand Bases

3.3 Explain Bronsted–Lowry theory of acids and bases.

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

3.5 Explain Lewis theory of acids and bases

3.6 State the limitations Lewis theory of acids and bases

3.7 Explain the Ionic product of water

3.8 Define pH and explain Sorenson scale

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

3.10 Define buffer solution and give examples.

3.11 State the applications of buffer solutions.

4. 0 Water Technology

4.1 State the various Sources of water.

4.2 Define the terms soft water and hardwater with examples

4.3 Define hardness of water.

4.4 Explain temporary and permanent hardness of water.

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

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

4.7 Disadvantages of using hardwater in industries.

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

4.9 Essential qualities of drinking water.

4.10 Explain municipal treatment of water for drinking purpose.

4.11 Define Osmosis and Reverse Osmosis(RO).

4.12 List the advantages of RO

5.0. ENVIRONMENTALSTUDIES

5.1 Define the term environment

5.2 Explain the scope and importance of environmental studies

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

5.4 Explain the growing energy needs

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

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

5.7 Define the terms:

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

5.8 Explain biodiversity and threats to biodiversity

COURSE CONTENT

A. ENGINEERINGCHEMISTRY

1. Fundamentals of Chemistry

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

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

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

2. Solutions

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

3. Acids and Bases

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

4. Water technology

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

5. ENVIRONMENTALSTUDIES

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

INTERNAL ASSESSMENT

UNIT TEST 1 : UNITS 1 and 2

UNIT TEST 2 : UNITS 3,4 and 5

REFERENCEBOOKS

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

ELECTRICAL ENGINEERING MATERIALS-I

Subject Title : Electrical Engineering Materials-1

Subject Code : EE-105

Periods/Week : 04

Periods/Year : 60

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Short questions	Essay questions
1.	Conducting Materials	16	29	3	2
2	Insulating Materials	14	26	2	2
3	Di- electric Materials	12	21	2	1½
4	Magnetic Materials	10	18	1	1½
5	Special Purpose Materials	8	16	2	1
	Total	60	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Comprehend the Conducting Materials

1.1 Define Conducting Materials

1.2 State the properties of conducting materials

1.3 Define the terms (i) Hardening (ii) Annealing

1.4 Explain the effects of Hardening and Annealing on copper with regard ing to Electrical and Mechanical properties.

1.5 State the main requirements of Low Resistivity Materials

1.6 State the main requirements of HighResistivity materials.

1.7 List some examples of i) Low Resistivity Materials

ii) High Resistivity materials

1.8 Mention the Properties & Applications of Copper and Aluminium

1.9 Distinguish between Copper and Aluminium.

1.10 Mention the properties & applications of ACSR Conductors and AAAC.

1.11 State the requirements of High Resistive Materials.

1.12 State the types of High Resistive Materials.

1.13 List the properties & Applications of High Resistive Materials.

i) Manganin	ii) Eureka
iii) Constantan	iv) Nichrome
v) Tungsten	vi) Platinum
vii) Mercury	viii) Carbon

1.14 List the colour codes of the resistors as per BIS.

2.0 Comprehend the Insulating Materials

2.1 Define Insulating Materials

2.2 Draw energy level diagrams of conductors, insulators and semi-Conductors.

2.3 Distinguish between conductors, insulators and semi-Conductors

2.4 State the important electrical properties of Insulating materials.

(i) Insulating resistance (ii) Volume (iii)Surface resistance

2.5 Explain factors affecting insulating resistance.

2.6 Classify Insulating materials on the basis of temperature

i.e (Y, A, E, B, F, H and C class)

2.7 Classify insulating materials.

2.8 State the properties of i) Impregnated paper ii) Wood iii)Cardboard iv)Asbestos v)Mica vi)Ceramics vii)Glass.

2.9 List the applications of the above insulating materials.

2.10 Explain Thermoplastic & Thermosetting resins with examples.

2.11 Explain the properties of PVC

2.12 List the applications of PVC.

2.13 State the effects of the following on P.V.C

(i) Filler (ii) Stabilizer (iii) Plasticizer (iv) Additives.

2.14 State the Properties of the following gasses

i) Air (ii) Nitrogen (iii) Hydrogen (iv) Sulphur – Hexafluoride (SF_6).

2.15 List the applications of the following gasses

i) Air (ii) Nitrogen (iii) Hydrogen (iv) Sulphur – Hexafluoride (SF_6).

3.0 **Know the Di- electric materials**

3.1 Give the Permittivity of commonly used di - electric materials

i)	Air	ii)	Bakelite
iii)	Glass	iv	Mica
v)	Paper	vi)	Porcelain
vii)	Transformer oil		

3.2 Explain Polarization.

3.3 Explain Dielectric Loss.

3.4 List any four applications of Dielectrics.

3.5 List the colour codes of the capacitors as per BIS.

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

4.0 Know the Magnetic Materials

4.1 Classify the Magnetic Material as:

(i) Ferro (ii) Para (iii) Dia-Magnetic materials with examples

4.2 Explain i) Soft Magnetic materials ii) Hard Magnetic materials

4.3 Draw i) B-H. Curve and ii)Hysteresis loop

4.4 Explain. Hysteresis loop.

4.5 Explain Hysteresis loss and State Steinmetz equation (No-Problems)

4.6 Explain Eddy Current Losses

4.7 State Curie point

4.8 Define Magnetostriction.

5.0 Understand the Special Purpose Materials

5.1 State the need for protective materials

5.2 List the various protective materials like Lead, Paints, Steel Tapes etc.

5.3 Explain the thermo couple materials.

5.4 State the Bi-metals

5.5 State the soldering materials

5.6 Define fuse

5.7 State the different types of materials used for fuse.

5.8 Explain the process of Galvanising and Impregnation

5.9 State the use of Enamel coated copper wires (thin, medium and thick).

5.10 State the importance of Nano Materials.

COURSE CONTENT

1. Conducting Materials

Hardening, Annealing - Low Resistive Materials – Requirements – Properties and applications of Copper and Aluminum - Comparison between Copper and Aluminum - ACSR Conductors, AAAC, - High Resistive Materials – Requirements- Properties and applications.

2. Insulating Materials

Properties -Insulation resistance - Factors effecting Insulation resistance - Classification of Insulation materials - Properties – Applications.

3. **Di- electric materials**

Permittivity of di - electric materials- Polarisation - Dielectric Loss –

Application of Dielectrics – Colour codes.

4. Magnetic Materials

Classification of magnetic materials - Soft & Hard magnetic materials- B-H Curves - Hysteresis loop - Hysteresis loss - Steinmetz constant - Eddy Current Loss -- Curie Point – Magnetostriction.

5. **Special Purpose Materials**

Protective materials – Thermocouple - Bi-Metals- Soldering- Fuses -Galvanizing and Impregnating - Nano Materials.

REFERENCES

3 Electrical Engineering Materials – N.I T.T.T.R Publications

4 Introduction to Engineering materials – B.K.Agarwal.

5 Materials science for Electrical and Electronic Engineers – Ian P.Jones (Oxford Publications)

6 Electrical Engineering Materials and Semiconductors-J.B.Guptha and Rena Guptha,SK Kotaria &Sons Publishers

BASIC ELECTRICAL ENGINEERING-I

Subject Title : Basic Electrical Engineering-I

Subject Code : EE-106

Periods/Week : 04

Periods/Year : 60

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Short questions	Essay questions
1.	Electric Current-Ohm's law, Resistance.	22	42	4	3
2	Series and Parallel Resistance Circuits	20	36	2	3
3.	Work, Power and Energy	18	32	4	2
	Total	60	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Comprehend the basic Principles of Electricity

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

1.2 State Ohm's Law.

1.3 Explain Ohm's Law

1.4 List the limitations of Ohms Law.

1.5 Explain the concept of Resistance to flow of electrons.

1.6 Define the terms i)specific resistance ii)conductance and iii)conductivity.

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

1.8 Solve simple problems based on the Ohm's Law & $R = (\rho l) / a$.

1.9 State the effect of Alloying on Resistivity.

1.10 Explain the effects of temperature on resistance

1.11 Develop the expression for resistance at any temperature as $R_t = R_o (1+\alpha_o t)$

1.12 Define temperature co- efficient of resistance and give its unit.

1.13 Develop the formula for co-efficient of resistance at any temperature as $\alpha_t = \alpha_o / (1+\alpha_o t)$

1.14 Solve problems based on the $R_t = R_o (1+\alpha_o t)$ & $\alpha_t = \alpha_o / (1+\alpha_o t)$.

2.0 Explain the concept of Series and Parallel Resistance Circuits

2.1 Develop the expressions for equivalent Resistance with simple series connections.

2.2 Develop the expressions for equivalent Resistance with simple parallel connections.

2.3 Solve problems on equivalent resistance in the case of series- parallel networks.

2.4 Solve problems on division of current when Two Resistors are connected in parallel.

3.0 Explain the concept of work, power & energy

3.1 State the S.I. System of units for work, power and energy

3.2 Express work, power and energy in Electrical, Mechanical and Thermal Units
.

3.3 Define efficiency.

3.4 Calculate electricity bill for domestic consumers.

3.5 Solve problems on work, power and energy in Electrical, Mechanical and Thermal units.

COURSE CONTENT

1. Electric Current - Ohm's Law - Resistance

Conductor, Insulator , semi-Conductor - Electric Potential – Ohm's law – Resistance – Specific Resistance – Conductivity – Temperature coefficient of Resistance.

2. **Series and Parallel Resistance Circuits**

Resistance in series, parallel and series - parallel combinations-Current division in parallel circuits.

3. Work, Power & Energy

Units of work, power and energy. – Conversion of Units-Efficiency

REFERENCES

1. B.L.Theraja -Electrical Technology Vol.I- S.Chand &co.
2. T.K.Nagsarkar & M.S.Sukhija -Basic Electrical Engineering– Oxford.
3. Hughes-Electrical Technology
4. J.B.Gupta -Electrical Techology Vol.I
5. G.B.Bharadhwajan & A. Subba Rao -Elements of Electrical Engineering.
6. D C Kulshreshtha.-Basic Electrical Engineering .
7. Engineering D.P.Kothari & I.J.Nagarath -Theory and Problems of Basic Electrical -PHI
8. Abhijit Chakrabarthi,Sudipta nath, Chandan Kumar Chada -Basic Electrical Engineering.
9. Principles of Electrical Engg.& Electronics- V.K.Mehtha,Rohith Mehtha-S.Chand Publishers

ENGINEERING DRAWING- I

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

TIME SCHEDULE

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

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

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

1.0 Understand the basic concepts of Engineering Drawing

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

2.0 Use of Engineering Drawing Instruments

2.1 Select the correct instruments and draw lines of different orientation.
2.2 Select the correct instruments and draw small and large Circles.
2.3 Select the correct instruments for measuring distances on the drawing.
2.4 Use correct grade of pencil for different types of lines, thickness and given function.
2.5 Select and use appropriate scales for a given application.
2.6 Identify different drawing sheet sizes as per I.S. and Standard Lay- outs.
2.7 Prepare Title block as per B.I.S. Specifications.
2.8 Identify the steps to be taken to keep the drawing clean and tidy.

Drawing Plate 1: (Having Four exercises)

3.0 Write Free Hand Lettering and Numbers

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

Drawing plate 2: (Having 5 to 6 exercises)

4.0 Understand Dimensioning Practice

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

Drawing Plate 3: (Having 8 to10 exercises)

5.0 Apply Principles of Geometric Constructions

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

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

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

6.1 Visualize the objects
6.2 Explain the I-angle and III-angle projections
6.2 Practice the I-angle projections
6.3 Draw the projection of a point with respect to reference planes (HP&VP)
6.4 Draw the projections of straight lines with respect to two reference Planes (up to lines parallel to one plane and inclined to other plane)
6.5 Draw the projections of planes (up to planes perpendicular to one plane and inclined to other plane)
6.6 Draw the projections of solids (up to axis of solids parallel to one plane and inclined to other plane)

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

7.0 Appreciate the need of Sectional Views

7.1 Explain the need to draw sectional views.

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

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

Competencies and Key competencies to be achieved by the student

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

COURSE CONTENT

NOTE

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

1.0 The importance of Engineering Drawing

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

2.0 Engineering drawing Instruments

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

sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents, Care and maintenance of Drawing Sheet, Drawing plate:
Lay out of sheet – as per SP-46-1988 to a suitable scale.
Simple Exercises on the use of Drawing Instruments. Importance of Title Block.

3.0 Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering
Practicing of letters & numbers of given sizes (7mm, 10mm and 14mm)
Advantages of single stroke or simple style of lettering - Use of lettering stencils

4.0 Dimensioning practice

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

5.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts internally examples in engineering application.
Construction of tangent lines: to draw tangent lines touching circles internally and externally.
Construction of tangent arcs
i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles).
ii)Tangent arc of given radius touching a circle or an arc and a given line.
iii)Tangent arcs of radius R, touching two given circles internally and externally.
Construction of polygon:construction of any regular polygon of given side length using general method
Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Engg. application viz. Projectiles, reflectors, P-V Diagram of a Hyperbolic process,
Construction of any conic section of given eccentricity by general method
Construction of ellipse by concentric circles method
Construction of parabola by rectangle method
Construction of rectangular hyperbola
General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering application, viz, Gear tooth profile, screw threads, springs etc. - their construction

6.0 Projection of points, lines and planes & solids

Projecting a point on two planes of projection -Projecting a point on three planes of projection -Projection of straight line.
(a) Parallel to both the planes.
(b) Perpendicular to one of the planes.
(c) inclined to one plane and parallel to other planes
Projection of regular planes
(a) Plane perpendicular to HP and parallel to VP and vice versa.
(c) Plane perpendicular to HP and inclined to VP and vice versa.

Projection of regular solids

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

7.0 Sectional views

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

REFERENCE BOOKS

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

BASIC ELECTRICAL WORKSHOP PRACTICE-I

Subject Title : Basic Electrical Work shop Practice-I

Subject Code : EE-108

Periods/Week : 06

Periods/Year : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Wiring tools and Accessories	15
2.	Electrical Wiring Joints	15
3.	Lamp Circuits	35
4.	Soldering Practice	25
Total		90

OBJECTIVES

Upon completion of the practice the student shall be able to

1.0 Handle the Wiring Tools and Accessories

1.1 Identify the following electrical wiring tools with respect to

i) Size ii) Shape iii) Purpose iv) Use .

a) Screw drivers
b) Pliers
c) Drilling machines & Drilling Bits.
d) Rawl plug jumper, and poker
e) Voltage/line tester
f) Splicers (insulation remover)
g) Standard Wire gauge

1.2 Identify different types of Electrical Wiring accessories with respect to

i) Size ii) Shape iii) Purpose iv) Use.

a) Switches
b) Ceiling roses
c) Lamp holders and adopters
d) Sockets
e) Plug
f) Fuses

1.3 Identify different types of main switches with respect to

i) Rating ii) Purpose iii) Use.

SP,DP mains, TP,ICDP, ICTP, SPDT, DPDT, TPDT, Changeover-Knife type/globular, Rotary, micro, modular switches.

1.4 Study of 1-pole,2-Pole and 3-pole MCB's with respect to rating, purpose, And Use etc.

1.5 Study different types of wires and cables (1/18,3/20,7/20) with respect to sizes ,rating,

Purpose and Use etc

2.0 Prepare Electrical Wiring Joints

2.1 Prepare straight joint/ Married joint

2.2 Prepare T joint

2.3 Prepare Western union joint

2.4 Prepare pigtail joint

3.0 Practice Lamp Circuits

3.1 Make a circuit with One lamp controlled by one switch with PVC surface conduit system

3.2 Make a circuit with Two lamps controlled by two switches with PVC surface conduit system

3.3 Make a circuit with One lamp controlled by one switch and provision of 2/3-pin socket.

3.4 Make a circuit for Stair case wiring

3.5 Make a circuit for Godown wiring

3.6 Make a circuit for Electrical bell connection.

3.7 Make a circuit for ceiling fan with regulator

.

4.0 Practice Soldering

4.1 Get familiarized to use of various soldering tools and components

4.2 Solder simple electronic circuits with PCB

Competencies to be achieved by the Student

S.No	Experiment title	Competencies

1.1	Handle the different wiring a) tools and accessories b) select switches, and MCB's c) Identify wires and cables as per the requirements of the load.	• Identify the size and specifications of various tools used for electrical wiring. • Understand the usage of the standard wire gauge. • Identify the type, size and specifications of DP mains,
2.1	To prepare a Straight joint/Married joint using a 7/20 Al. Cable	• Identify the size of the cable • Perform splicing of Insulation properly. • Perform Straight joint/Married joint
2.2	To prepare a T joint using a 7/20 Al. Cable	• Insert the leads of the wires properly as per the sketches. • Twist the wires properly.
2.3	To prepare a Western union joint using a single strand Al. Cable	• Overlap the two wires properly • Twist the binding wires properly
2.4	To prepare a pig tail joint using a single strand Copper Cable	• Place the wires in V-shape. • Twist the wires in clock wise direction.
3.1	To control one lamp by one 1-way switch with PVC surface conduit wiring system	• Draw wiring diagram • Identify the size of cable, PVC pipe, type of 1-way switch and lamp holder. • Make Connections as per Wiring Diagram
3.2	To control two lamps by two 1-way switches with PVC surface conduit wiring system	• Draw wiring diagram • Handle the screw driver, electrician Knife, line tester to fix the PVC pipe using saddles and junction boxes. • Select colour and length of wire for phase and neutral • Switch on the supply after making of the connections • Disconnect the circuit after testing.
3.3	To control one lamp and 2/3 pin socket by two1-way switches with PVC surface conduit wiring system	• Connect 2/3 pin socket properly with respect to phase, neutral and earth. • Connect phase wire through switches.
3.4	Stair-case wiring	• Select two 2-way switches • Connect 2- way switches as per circuit diagram. • Test with 1-phase, 230V, 50 Hz supply to the circuit connected through ICDP switch.
3.5	Godown wiring scheme	• Draw wiring diagram • Connect the circuit as per the diagram. • Observe sequence of operation of switches • Test with 1-phase,230 V,50 Hz supply to the circuit, neutral wire to the bottom point of the 1-way switch and phase to the first point of lamp holder
3.6	To control Electrical Bell	• Connect the bell through ceiling rose properly. • Make ceiling rose connections properly
3.7	To connect the Ceiling fan	• Draw the wiring diagram showing the switch and regulator

		• Connect the circuit through the regulator
4.0	Soldering Practice Of Simple Electronic Circuit	• Proper use of Lead and Flux • Maintain proper temperature of soldering iron.

Reference

1. Electrical work shop By R.P.Singh

2. Experiments in Basic Electrical Engineering by S.K.Bhattacharya , Rastogi- NAI.

3. Electrical Design Estimating And Costing By K.B. RAINA & S.K.BHATTA CHARYA
4. Residential and Commercial Industrial Electrical systems Vol.2 by Joshi-TMH
5. Residential and Commercial Industrial Electrical systems Vol.3 by Joshi-TMH
6. Industrial Safety management by Deshmukh -TMH

PHYSICS LAB - I

(Common for all branches)

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

TIME SCHEDULE

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

Objectives:

Upon completion of the course the student shall be able to

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

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

3.0 Verify the parallelogram law and Triangle law of forces.

4.0 Verify the Boyle's law employing a Quill tube

5.0 Determine the refractive index of a solid using travelling microscope

6.0 Determine the specific resistance of wire material using Meter Bridge

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	Competencies	Key competencies
1. Hands on practice on Vernier Calipers(03)	• Find the Least count • Fix the specimen in position • Read the scales • Calculate the volume of given object	• Read the scales • Calculate the volume of given object
2. Hands on practice on Screw gauge(03)	• Find the Least count • Fix the specimen in position • Read the scales • Calculate thickness of glass plate and cross section of wire	• Read the scales • Calculate thickness of given glass plate • Calculate cross section of wire
3. Verification of Parallelogram law of forces and Triangle law of forces(03)	• Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle • Find the length of sides • Compare the ratios	• Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
4. Boyle's law verification (03)	• Note the atmospheric pressure • Fix the quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated value P x l	• Find the length of air column • Find the pressure of enclosed air • Find the value P x l

5. Refractive index of solid using traveling microscope(03)	• Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab	• Read the scale • Calculate the refractive index of glass slab
6. Meter bridge(03)	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific resistance	• Find the balancing length • Calculate unknown resistance • Calculate the specific resistance

CHEMISTRY LAB - I

(Common for all branches)

Subject Title	**:**	**Chemistry Lab - I**
Subject Code	**:**	**EE-110**
Periods per week	**:**	**03**
Total periods per semester	**:**	**22**

TIMESCHEDULE

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

COMPUTER FUNDAMENTALS LAB -1

(Common To All Branches)

Subject Title : Computer Fundamentals Lab - 1
Subject Code : Common - 110
Periods/Week : 3
Periods/Semester : 45

LIST OF EXPERIMENTS

1.0 BASICS

1.1. Identify the various components of a Computer system

1.2. Differentiate between hardware and software

1.3. State the configuration of a computer system

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

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

1.6. Exercise how to use calculator

2.0 DOS Operating System

2.1. Practice on Internal and External commands.

2.2. Create and use Batch Files.

2.3. Know the usage of Editors.

3.0 WINDOWS Operating System

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

3.2. Exercise on use of Recycle Bin

3.3. Exercise on use of My Computer and My Documents

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

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

3.6. Exercise on searching of files and folders

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

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

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

3.10. Change the system date and time.

4.0 Internet

4.1. Importance of web browser software

4.2. Structure of URL

4.3. Create an E-mail account

4.4. Send an E-mail

4.5. Receive an E-mail

4.6. Browse the Internet using various search engines

OBJECTIVES AND KEY COMPETENCIES

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

10.	Exercise on use of My Computer and My Documents	➢ Able to Access files and folders in C: Drive ➢ Able Access files and folders in other drives ➢ Able to use My Documents so that organize and access files and folders in it ➢ Able to use My Documents so that Organizing files in My Music, My Pictures, My Videos ➢ Able to create short cut for My Documents on desktop properly	❖ Check whether able to access files in C: Drive using My Computer correctly or not ❖ Check whether able to access files in other drives using My Computer correctly or not ❖ Check whether able use CD/DVD drive using My Computer ❖ Check whether able to organize files and folders in My Documents ❖ Check Whether able to organize files in My Music, My Pictures, My Videos in My Documents ❖ Check able to create short cut for My Documents on desktop properly
11.	Exercise on creation of shortcut to files and folders (in other folders) on Desktop	➢ Able to create shortcut of files and folders on desktop	❖ Check whether can able to create shortcut for any files created on desktop ❖ Check whether can able to create shortcut for any folder created on desktop
12.	Exercise on arranging of icons – name wise, size, type, Modified	➢ Able to arranging of icons – name wise, size, type, Modified on desktop	❖ Observe whether able to arrange of icons – name wise, size, type, Modified
13.	Exercise on searching of files and folders	➢ Able to search of files and folders	❖ Check searching of files and folders
14.	Exercise on using of explorer for accessing of files and folders	➢ Able to use of explorer for accessing of files and folder	❖ Check use of explorer for accessing of files and folders
15.	Exercise on organizing files / folders using copy and paste of files and folders	➢ Able to organizing files / folders using copy and paste of files and folders using explorer ➢ Able to organizing files / folders using copy and paste of files and folders using My Computer	❖ Check organizing files / folders using copy and paste of files and folders ❖ Check organizing files / folders using copy and paste of files and folders using my computer
16.	Exercise using Calculator from Accessories and through Run	➢ Able to use calculator in Standard mode ➢ Able to use calculator in Scientific mode	❖ Check calculator in Standard mode ❖ Check calculator in Scientific mode
17.	Exercise on shutdown of computer system	➢ Able to shutdown of computer system	❖ Check shutdown of computer system
18.	Exercise on understanding the	➢ Able to understand the use of Taskbar by opening some applications	❖ Check the use of Taskbar by opening some applications

	use of Taskbar		
19.	Exercise on using of Internet Explorer or any other browser	Able to use of Internet Explorer Able to use of Mozilla Firefox Able to use of Google Chrome Able to use of opera	❖ Check use of Internet Explorer ❖ Check use of Mozilla Firefox ❖ Check use of Google Chrome ❖ Check use of opera
20.	Change resolution, color, appearance, screen server options of Display	Able to change resolution, color, appearance, screen server options of Display	❖ Check resolution, color, appearance, screen server options of Display
21.	Change the system date and time	Able to change system date and time	❖ Check change system date and time
22.	Create an E-mail account	Able to create an E-mail account	❖ Check able to create an E-mail account
23.	Send an E-mail	able to send an E-mail	❖ Check able to send an E-mail
24.	Receive an E-mail	able to receive an E-mail	❖ Check able to receive an E-mail
25.	Browse the Internet using various search engines	Able to search for a content in the Internet using various search engines	❖ Check able to search for a content in the Internet using various search engines

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING
C-16, SCHEME OF INSTRUCTIONS AND EXAMINATIONS
2ND SEMESTER

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:								
EE-205	Electrical Engineering Materials-II	4	-	60	3	20	80	100
EE-206	Basic Electrical Engineering-II	4	-	60	3	20	80	100
PRACTICAL:								
EE-208	Basic Electrical Work Shop Practice-II	-	6	90	3	40	60	100
	TOTAL							

English for Polytechnics

(Common to All the Branches)
Second Semester

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

Objectives and Key Competencies

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

06	**Describing Words**	• Listen for general comprehension • Listen for specific details • identify adjectives and know what an adjective is • use adjectives accurately	• Listen for main idea and minute details • Learn several adjectives • Know the common errors in the use of adjectives
07	**The Here and Now**	• Listen for general comprehension • Listen for specific details • identify prepositions and understand what prepositions are • Use prepositions	• Listen for main idea and minute details • Learn the prepositions of place • Learn the prepositions of time • Learn the common errors in the use of prepositions
08	**An Environmental Challenge**	• Comprehend the main idea • Learn new words	• Learn how to identify the central idea • Learn some new words
09	**The Will to Succeed**	• Understand the main idea • Learn narrative style of writing	• Know the secret of success of a woman entrepreneur • Know the narrative style of writing • Learn new words
10	**Waiting for Mr. Clean**	• Understand the main idea • Identify conversational style of writing • Learn new words	• Learn to note down the central idea of a paragraph • Learn new words
11	**Reported Speech**	• Understand what reported speech is • Report something spoken by others	• Learn two ways of reporting a speaker's words • Learn how to change from direct speech to indirect speech
12	**Error Analysis-I**	• Identify common errors in sentences • Correct errors in the usage of nouns, pronouns and verbs	• Know the various errors in spoken and written English • Identify the common errors • Correct the errors in nouns, pronouns and verbs
13	**Error Analysis – II**	• Identify the errors in usage of English • Correct errors in the usage of articles, adjectives, adverbs, prepositions and	• Correct the errors in the usage of articles, adjectives, adverbs, prepositions and conjunctions • Rewrite a paragraph

		conjunctions	correcting the errors
14	**Error Analysis – III**	• Correct errors in vocabulary, questions, subject-verb agreement, homophones • Identify errors of redundancy	• Correct the errors in the usage of vocabulary and in framing questions • Correct the errors in concord and redundancy
15	**Data Interpretation - I**	• Study and understand the information in flow charts • analyse/interpret flow charts • Write a paragraph using the data given	• Study the data given in flow charts • analyse the data given in flow charts • Write a paragraph using the data given
16	**Data Interpretation – II**	• Understand the information in a tree diagram • Analyse the data • Write a paragraph using the data given	• Study the data given in tree diagrams • analyse the data given in tree diagrams • Write a paragraph using the data given
17	**Data Interpretation – III**	• Understand the data in the table • Present the data given in a table • Write a paragraph using he data given	• Study the data given in tables • analyse the data given in tables • Write a paragraph using the data given
18	**Resume**	• Understand what a resume is • Prepare a resume	• Learn the salient features of a resume • Observe a sample resume given • Prepare a resume
19	**Cover Letter**	• Understand what a cover letter is • Write a cover letter	• Know the importance of a cover letter • Read the sample cover letter • Write a cover letter
20	**Note Making**	• Identify important words and ideas in a text • Learn how to make notes using the cue method	• Know the importance of making notes • Look for the key words given in the text • Observe the sample outline using cue method

			• Make notes using cue and mapping methods
21	**Writing a Report**	• Understand the format of a report of an industrial visit • Write a report using the format	• Learn the various kinds of reports • Observe the format of a report of an industrial visit • Learn the tips to write a report • Write a report

Weightage Table

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

ENGINEERING MATHEMATICS - II

(Common to all branches)

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

Time Schedule with BLUEPRINT

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

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

Objectives

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

UNIT - I

Coordinate Geometry

1.0 Solve the problems on Straight lines

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

1.2 Solve simple problems on the above forms

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

2.0 Solve the problems on Circles

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

2.2 Find the equation of a circle given

(i) Center and radius

(ii) Two ends of a diameter

(iii) Centre and a point on the circumference

(iv) Three non-collinear points

(v) Centre and tangent

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

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

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

UNIT - II

Differential Calculus

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

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

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

3.3 Solve the problems using the above standard limits

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

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

4.0 Appreciate Differentiation and its meaning in engineering situations

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

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

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

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

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

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

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

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

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

4.9 Find the derivatives of hyperbolic functions.

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

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

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

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

4.14 Explain the definition of Homogenous function of degree n

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

UNIT - III

Applications of the Differentiation

5.0 Understand the Geometrical Applications of Derivatives

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

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

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

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

6.0 Use Derivatives to find extreme values of functions

6.1 Define the concept of increasing and decreasing functions.

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

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

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

COURSE CONTENT

UNIT-I

Coordinate geometry

1. Straight lines: various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.
2. Circle: locus of a point, Circle definition-Circle equation given (i) center and radius, (ii) two ends of a diameter (iii) Centre and a point on the circumference (iv) three non collinear points and (v) Centre and tangent equation - general equation of a circle - finding center, radius: tangent, normal to circle at a point on it.

UNIT-II

Differential Calculus

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

UNIT-III

Applications of Derivatives:

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

Reference Books:

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

ENGINEERING PHYSICS-II

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

TIME SCHEDULE

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

INTERNAL ASSESSMENT

UNIT TEST 1 : UNITS 1,2 and 3

UNIT TEST 2 : UNITS 4,5 and 6

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Friction

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

2.0 Understand the concept of Work, Power, and Energy

2.1 Define the terms Work, Power and Energy.
2.2 State SI units and dimensional formula for Work, Power, and Energy
2.3 Define potential energy
2.4 Derive an expression for Potential energy with examples
2.5 Define kinetic energy
2.6 Derive an expression for kinetic energy with examples

2.7 State and prove Work- Energy theorem
2.8 Explain the relation between Kinetic energy and momentum
2.9 State the law of conservation of energy
2.10 Verify the law of conservation of energy in the case of a freely falling body
2.11 Solve the related numerical problems

3.0 Understand the concept of Simple harmonic motion

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

4.0 Understand the concept of Sound

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

5.0 Understand the properties of matter

5.1 Define terms Elasticity and plasticity
5.2 Define the terms stress and strain
5.3 State the units and dimensional formulae for stress and strain
5.4 State the Hooke's law
5.5 Define the surface tension
5.6 Explain Surface tension with reference to molecular theory
5.7 Define angle of contact
5.8 Define capillarity and state examples
5.9 Write the formula for surface tension based on capilarity
5.10 Explain the concept of Viscosity
5.11 Provide examples for surface tension and Viscosity
5.12 State Newton's formula for viscous force
5.13 Define co-efficient of viscosity
5.14 Explain the effect of temperature on viscosity of liquids and gases

5.15 State Poiseulle's equation for Co-efficient of viscosity
5.16 Solve the related numerical problems

6.0 Understand the concept of Electricity and Magnetism

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

COURSE CONTENT

1. Friction:

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

2. Work, Power and Energy:

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

3. Simple Harmonic Motion:

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

4. Sound:

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

5. Properties of matter

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

viscosity- The related numerical problems

6. Electricity & Magnetism:

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

REFERENCE BOOKS

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

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES- II

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

TIMESCHEDULE

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

1.0 Principles of Metallurgy

1.1 List the Characteristics of Metals.

1.2 Distinguish between Metals and Non Metals

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

1.4 Describe Froth Floatation method of concentration of ore.

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

1.6 Explain the purification of Metals by Electrolytic Refining

1.7 Define an Alloy

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

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

2.0 Electrochemistry

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

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

2.3 Distinguish between metallic conductors and Electrolytic conductors.

2.4 Explain Arrhenius theory of electrolytic dissociation

2.5 Explain electrolysis of fused NaCl.

2.6 ExplainFaraday'slawsofelectrolysis

2.7 Define Chemicalequivalent, Electrochemicalequivalent.

2.8 Solve the NumericalproblemsbasedonFaraday'slawsofelectrolysis

2.9 DefineGalvaniccell

2.10 Explain the construction and working of Galvaniccell

2.11 Distinguishbetweenelectrolyticcellandgalvaniccell

2.12 Explain thestandardelectrodepotentials

2.13 Defineelectrochemicalseriesand explainitssignificance.

2.14 Define and explainemfofacell.

2.15 Solve the numericalproblemsonemfofcell

3.0 Corrosion

3.1 Define the term corrosion

3.2 Explain the Factorsinfluencingtherateofcorrosion

3.3 Explaintheconceptofelectrochemicaltheoryofcorrosion

3.4 Describetheformationofa)compositioncell,b)stresscell c)concentrationcell

3.5 Define rust and explainthemechanismofrustingofiron with equations.

3.6 Explainthemethodsofpreventionofcorrosion: a)Protectivecoatings

b) Cathodicprotection(SacrificialanodeprocessandImpressed–voltage process)

4.0 Polymers

4.1 Explain theconceptofpolymerisation

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

4.3 Definethetermplastic

4.4 Types of plasticswithexamples.

4.5 Distinguishbetweenthermoplasticsandthermosettingplastics

4.6 List the Characteristicsofplastics.

4.7 State the advantagesof plasticsovertraditionalmaterials

4.8 State the disadvantagesofusingplastics.

4.9 Explain the methodsofpreparation and uses of the followingplastics:

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

4.10 Definethetermnaturalrubber

4.11 StatethestructuralformulaofNaturalrubber

4.12 ExplaintheprocessingofNaturalrubberfrom latex

4.13 List the Characteristicsofnaturalrubber

4.14 ExplaintheprocessofVulcanization

4.15 List the CharacteristicsofVulcanizedrubber

4.16 DefinethetermElastomer

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

5.0 Fuels

5.1 Definethetermfuel

5.2 Classify thefuelsbasedonphysicalstate –solid, liquidandgaseous fuels with examples.

5.3 Classify thefuelsbasedonoccurrence-primaryandsecondaryfuels with examples.

5.4 List the characteristicsof a goodfuel.

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

6.0. ENVIRONMENTALSTUDIES

6.1. Defineairpollution

6.2 Classify the airpollutants-basedonoriginandstateofmatter

6.3 Explainthecausesofairpollution

6.4 Explaintheuseandoverexploitationofforestresourcesanddeforestation

6.5 Explaintheeffectsofairpollutiononhumanbeings,plantsandanimals

6.6 Explainthegreenhouseeffect -ozonelayerdepletionandacidrain

6.7 Explainthemethodsofcontrolofairpollution

6.8 Definewaterpollution

6.9 Explainthecausesofwaterpollution

6.10 Explaintheeffectsofwaterpollutiononlivingandnonlivingthings

6.11 Understandthemethodsofcontrolofwaterpollution.

COURSE CONTENT

1. PrinciplesofMetallurgy

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

2. Electrochemistry

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

3. Corrosion

Introduction - factors influencing corrosion - electrochemical theory of corrosion-composition,stressandconcentrationcells–rustingofiron and its mechanism – prevention of corrosion by coating methods, cathodic protection

4. Polymers

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

5. Fuels

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

6. ENVIRONMENTALSTUDIES

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

INTERNAL ASSESSMENT

UNIT TEST 1 : UNITS 1,2 and 3

UNIT TEST 2 : UNITS 4 and 5

REFERENCEBOOKS

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

ELECTRICAL ENGINEERING MATERIALS-II

Subject Title : Electrical Engineering Materials-II

Subject Code : EE-205

Periods/Week : 04

Periods/Year : 60

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Short questions	Essay questions
1	Semi Conducting Material	7	16	2	1
2	Semiconductor Devices	15	26	2	2
3	Electrostatics	8	16	2	1
4	Capacitance	15	26	2	2
5	Batteries	15	26	2	2
	Total	60	110	10	08

OBJECTIVES

1.0 Understand the Semi conducting Materials

1.1 Define Semi-conducting materials

1.2 Understand Semi-conducting materials.

1.3 Classify Semi-conducting materials.

1.4 Define i) Intrinsic Semi-conductors ii)Extrinsic Semi-conductors.

1.5 Distinguish between Intrinsic and Extrinsic semi-conductors.

1.6 Explain the formation of i) P type semi-conductors

ii) N type semi-conductors.

1.7 Distinguish between P typeand N type semi-conductors.

2.0 comprehend the Semi-conductor devices

2.1 Explain the working of PN Junction diode with no bias, forward bias and reverse bias

2.2 Explain the operation of Zener diode.

2.3 Draw the characteristics of Zener diode.

2.4 Explain formation of PNP transistors.

2.5 Explain formation of NPN transistors.

2.6 State the different transistor configurations.

2.7 Plot the performance characteristics of a transistor in CB , CE configurations.

2.8 Compare the performance characteristics of transistor in CB and CE Configurations.

2.9 List the manufacturer specifications of

i) PN junction diode ii) Zener diode and iii) Transistor

3.0. Comprehend 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 problems on the above

3.4 Explain electrostatic field.

3.5 Plot electrostatic field due to

i) Isolated positive charges
ii) Isolated negative charge
iii) Unlike charges side by side
iv) Like charges side by side

3.6 State electric flux, electric flux density and field intensity.

3.7 Compare electrostatic and magnetic circuits.

3.8 State Gauss theorem.

3.9 Explain electric potential and potential difference.

3.10 Explain di-electric strength and di-electric constant

4.0. Explain about capacitance

4.1 Define capacitance and state its unit.

4.2 Derive the formula for capacitance of a capacitor.

4.3 State different types of capacitors

4.4 Give uses of different capacitors

4.5 Explain equivalent capacitance of

i) Capacitors connected in series;
ii) Capacitors connected in parallel

4.6 Derive an expression for energy stored in a capacitor

4.7 Solve problems on the above

5.0. Comprehend the Batteries

5.1 Classify cells as primary and secondary cells.

5.2 Distinguish between primary and secondary cells.

5.3 Name the types of storage cells as lead acid, Nickel iron and Nickel Cadmium.

5.4 Explain the parts of lead acid battery.

5.5 Write chemical reactions during charging and discharging of lead acid battery.

5.6 List indications of fully charged lead acid battery.

5.7 Explain parts of Nickel – iron cells

5.8 Write chemical reactions during charging and discharging of Nickel – iron cell.

5.9 State applications of (i) Lead acid battery (ii) Nickel iron cell

(iii) Nickel Cadmium battery.

5.10 Compare Lead acid cell with Nickel iron cell.

5.11 Explain charging of batteries by i)Constant current method

ii)Constant Voltage method.

5.12 State precautions to be taken during charging & discharging of batteries.

5.13 Explain trickle charging

5.14 State capacity of a battery and factors affecting capacity.

5.15 State Ampere- hour efficiency and Watt- hour efficiency of battery

5.16 Solve problems on the Ampere – Hour Efficiency and Watt – Hour Efficiency

5.17 Define maintenance free battery

5.18 Differentiate between maintenance free batteries and lead-acid batteries

5.19 Explain the construction and working of maintenance free batteries

5.20 State the applications of maintenance free batteries.

COURSE CONTENT

1. Semi conducting Materials

Semi-conductors - Intrinsic and extrinsic semi- conductors-`P' and `N' type Materials

2. Semi-conductor Devices

PN Junction, forward and reverse bias- Zener diode, Zener diode characteristics – formation of PNP and NPN transistors- Transistor configurations- CB, CE - Input and output characteristics of CB,CE - comparison of CB,CE configurations

3. Electrostatics

Atom, Ion, positive and Negative charges -Laws of Electrostatics – coulomb - Permittivity - Electrostatic induction -Electrostatic field - lines of force -Comparison of electrostatic and magnetic lines of force - Strength of electric field- Flux density -Gauss theorem - Electric potential - potential difference –Dielectric strength - Dielectric constant –

4. Capacitance

Capacitance -Capacitor - types - Capacitors in series and parallel- Energy stored in a capacitor.

5. Batteries

Primary cell and Secondary cells-Lead acid, Nickel iron and Nickel - cadmium-Chemical reactions during charging and discharging – Charging of Batteries- Constant current method and constant voltage method-Trickle charging - Capacity of Battery - Ampere-hour efficiency and watt-hour efficiency - Maintenance free batteries

REFERENCES

1 Electronic Components -Dr. K.Padmanabham
2 Electronic Components -D.V.Prasad
3 Electrical Engineering Materials – N.I T.T.T.R Publications

4 Introduction to Engineering materials – B.K.Agarwal.

5 Materials science for Electrical and Electronic Engineers – Ian P.Jones (Oxford Publications)

6 Electrical Engineering Materials and Semiconductors-J.B.Guptha and Rena Guptha,SK Kotaria &Sons Publishers

BASIC ELECTRICAL ENGINEERING-II

Subject Title : Basic Electrical Engineering-II

Subject Code : EE-206

Periods/Week : 04

Periods/Year : 60

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Short questions	Essay questions
1	Heating effects of electric Current	16	29	3	2
2	Magnetic effects of Electric current	24	42	4	3
3	Electromagnetic Induction	20	39	3	3
	Total	60	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Appreciate the Heating effects of Electric Current

1.1 Explain the Mechanical equivalent of heat.

1.2 State the heat produced due to flow of current.

1.3 Explain the applications of heat produced due to Electric current in

i) Metal Filament lamps ii)Electric kettle iii) Electric cooker iv) Electric Iron

v) Space heaters vi) Geyser vii) Infrared lamp.

1.4 Define thermal efficiency.

1.5 Solve problems on the above.

2.0. Appreciate the magnetic effects of Electric Current

2.1 Draw the lines of force around a magnetic.

2.2 Explain the concept of field lines around current carrying conductors

2.3 State Right hand thumb rule.

2.4 Plot the field pattern due to

i) Straight current carrying conductor ii) Solenoid iii) Toroid.

2.5 Explain Work law and its applications.

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

2.7 Give expressions for field strength (No derivation)

i) At Centre of a circular conductor
ii) At any point on the axis of a circular conductor
iii) Around a Straight conductor
iv) On the axis of a solenoid

2.8 Explain the Mechanical force on a current carrying Conductor in a Magnetic field.

2.9 Derive an expression for magnitude of the force on a conductor in a magneti field.

2.10 State the Fleming's left hand rule

2.11 Derive an expression for the force between two parallel current carrying conductors.

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

2.13 Define ampere

2.14 Solve problems on the above.

2.15 Define i) Magnetizing force ii) Permeability iii) flux iv) Reluctance

2.16 Derive the concept of the Magnetic circuits

2.17 Solve problems on simple magnetic circuits

2.18 Compare magnetic circuit with electric circuit.

2.19 State Magnetic leakage co-efficient.

3.0. Explain Electro Magnetic Induction

3.1 State Faraday's laws of electro - magnetic induction.

3.2 Explain dynamically and statically induced E.M.F.

3.3 State Lenz's law

3.4 Explain Fleming's right hand rule.

3.5 Explain the concept of self and mutual inductance.

3.6 Derive expressions for self and mutual inductance.

3.7 State co-efficient of coupling.

3.8 Explain the total inductance with series connections with reference to direction of flux.

3.9 Develop an expression for energy stored in a magnetic field.

3.10 Develop an expression for energy stored per unit volume

3.11 Develop an expression for lifting power of a magnet.

3.12 Solve problems on the above.

COURSE CONTENT

1. **Heating Effects of Electrical Current**
   Mechanical Equivalent of Heat - Heat produced due to flow of current in resistance- applications.

2. **Magnetic Effects of Electric Current**
   Lines of force - Field pattern due to long straight current carrying conductor-Field pattern of solenoid and Toroid -Work Law and its applications -Biot Savart Law(Laplace Law) - Field strength at centre and any point on the axis of a circular current carrying conductor- Field Strength around a straight current carrying conductor- Field strength on the axis of a solenoid-Mechanical force on a current carrying conductor in magnetic field - Direction of force - Fleming's left hand rule -Force between two parallel current carrying conductors – Ampere - Magnetic circuit- Magnetising force – permeability - flux - reluctance - Comparison of Magnetic circuit with electric circuit - Magnetic leakage.

3. **Electro Magnetic Induction**
   Faraday's laws - Dynamically and statically induced E.M.F -Lenz's Law & Fleming's right hand rule -Self and mutual inductance - Co-efficient of coupling - Inductances in series - Energy stored in a magnetic field - Energy stored per unit volume - Lifting power of magnet

REFERENCES

1. B.L.Theraja -Electrical Technology Vol.I- S.Chand &co.
2. T.K.Nagsarkar & M.S.Sukhija -Basic Electrical Engineering– Oxford.
3. Hughes-Electrical Technology

4. J.B.Gupta -Electrical Techology Vol.I

5. G.B.Bharadhwajan & A. Subba Rao -Elements of Electrical Engineering.

6. D C Kulshreshtha.-Basic Electrical Engineering .

7. Engineering D.P.Kothari & I.J.Nagarath -Theory and Problems of Basic Electrical -PHI

8. Abhijit Chakrabarthi,Sudipta nath, Chandan Kumar Chada -Basic Electrical Engineering.

9. Principles of Electrical Engg.& Electronics- V.K.Mehtha,Rohith Mehtha-S.Chand Publishers

ENGINEERING DRAWING- II

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

TIME SCHEDULE

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

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

Pre-Requisite: Clear visualization and sound pictorial intelligence

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

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

Drawing plate No.1: (Having 4 exercises)

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

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

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

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

4.0 Interpret Development of surfaces of different solids
- 11.1 State the need for preparing development drawing.

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

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

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

Competencies and Key competencies to be achieved by the student

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

COURSE CONTENT

NOTE

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

1.0 Auxiliary views

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

2.0 Orthographic Projections

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

3.0 Pictorial Drawings

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

4.0 Development of Surfaces

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

REFERENCE BOOKS

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

PHYSICS LAB – II

(Common for all branches)

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

TIME SCHEDULE

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

Objectives:

Upon completion of the course the student shall be able to

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

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

3.0 Determine the velocity of sound in air at room temperature

4.0 Determine the surface tension of a liquid using travelling microscope

5.0 Determine the viscosity of a liquid using capillary method

6.0 Practice the mapping of magnetic lines of force

Competencies and Key competencies to be achieved by the student

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

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

PREPARED BY BIFURCATION COMMITTEE

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2. Dr V.V.M. JAGANNADHA RAO, HGS, GPT, NARAYANKHED, SANGAREDDY DIST
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CHEMISTRY LAB – SEMESTER -II

(Common for all branches)

Subject Title : Chemistry Lab - II

Subject Code : EE-210

Periods per week : 03

Total periods per semester : 23

TIMESCHEDULE

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

PREPARED BY BIFURCATION COMMITTEE

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3. SMT. L.SEETHA, LECTURER IN CHEMISTRY, SGM GPT ABDULLAPURMET, R.R. DIST

*C**OMPUTER FUNDAMENTALS LAB -2***

(Common to All Braches other than CME & IT)

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

LIST OF EXPERIMENTS

1.0 MS-WORD

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

2.0 MS-EXCEL

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

3.0 MS-POWERPOINT

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

3.2. Inserting a new slide in the existing PowerPoint file

3.3. Inserting chart or image in a PowerPoint slide

3.4. Exercise with animation and sound features in PowerPoint

3.5. Exercise with Rehearse Timings feature in PowerPoint

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

OBJECTIVES AND KEY COMPETENCIES

S. No	Name of Experiment	Objectives	Key Competencies
1.	Open MS-Word from (i) Programs (ii) Run and Identify the components on the screen	➢ Able to Open MS-word and Identify the components on the screen	❖ Check whether able to Identify the components on the screen ❖ Check whether able to Identify all components on the screen of MSWORD are identified and learnt thoroughly
2.	Insertion of new rows and columns in the existing table and changing the background colour of the table	➢ Able to Insert new rows and columns in the existing table ➢ Able to Change the background colour of the table	❖ Check whether able to Insert new rows and columns in the existing table ❖ Check whether able to Insert new rows and columns as per requirement ❖ Check whether able to Change the background colour of the table
3.	Merging and splitting of cells in a Table	➢ Able to Merge and split cells in a Table using right click method	❖ Check whether able to Merge and split cells in a Table using right click method
4.	Changing the formatting of font	➢ Able to Change the formatting of font using right click menu ➢ Able to Change the formatting of font using menu options	❖ Check whether able to Change the formatting of font using right click menu ❖ Check whether able to Change the formatting of font using menu options
5.	Exercise with Headers and Footers	➢ Able to change Headers and Footers using menu option ➢ Able to change Headers and Footers by clicking top and bottom document	❖ Check whether Able to change Headers and Footers using menu option ❖ Check whether able to change Headers and Footers by clicking top and bottom document
6.	Create mailing letters using mail merge tool of MS-word	➢ Able to use mail merge tool of MS-word using start mail merge option in mail menu	❖ Check whether Able to use mail merge tool of MS-word in creating letter using mail merge option in mail menu
7.	Open MS-Excel and identify the	➢ Able to Open MS-Excel and identify the components on the screen	❖ Check whether Able to Open MS-Excel and identify the components on the screen

	components on the screen		❖ Check whether all components are known on screen
8.	Create a Worksheet in MS-Excel and save it in .xls or .xlsx format	✚ Able to Create a Worksheet in MS-Excel ✚ Able to save it in .xls or .xlsx format	❖ Check whether Able to Create a Worksheet in MS-Excel ❖ Check whether Able to save it in .xls or .xlsx format
9.	Inserting column and row in Excel	✚ Able to Insert column and row in Excel using menu options ✚ Able to Insert column and row in Excel by right clicking rows or columns appropriately	❖ Check whether able to Insert column and row in Excel using menu option ❖ Check proper addition rows and columns in given sheet ❖ Check whether able to Insert column and row in Excel by right clicking rows or columns appropriately
10.	Creation of new worksheet in the existing Excel Book file	✚ Able to create worksheet in the existing Excel Book file by using Insert worksheet option besides existing sheets	❖ Verify whether able to create worksheet in the existing Excel Book file by using Insert worksheet option
11.	Generate a Chart using the data in Excel-worksheet	✚ Able to Generate a Chart using the data in Excel-worksheet	❖ Check whether able to Generate a Chart using the data in Excel-worksheet ❖ Verify whether chart prepared is as per the data given
12.	Automate calculations in a worksheet using formula	✚ Able to Automate calculations in a worksheet using fx formula ✚ Able to use sigma function ✚ Able to use function library option in formula menu	❖ Check whether Able to Automate calculations in a worksheet using fx formula ❖ Verify whether Able to use sigma function ❖ Check whether Able to use function library option in formula menu
13.	Sort and filter data in a worksheet	✚ Able to Sort data in a worksheet using sort option in Data menu ✚ Able to Sort data in a worksheet using sort option in right click ✚ Able to filter data in a worksheet in data menu ✚ Able to filter data in a worksheet in right click	❖ Verify whether Able to Sort data in a worksheet using sort option in Data menu ❖ Verify whether Able to Sort data in a worksheet using sort option in right click ❖ Check whether Able to filter data in a worksheet in data menu ❖ Check whether Able to filter data in a worksheet in right click
14.	Inserting a new slide in the existing powerpoint file	✚ Able to Insert a new slide in the existing powerpoint file using newslide option in home menu ✚ Able to Insert a new slide in the existing powerpoint file using slide layout option in home menu	❖ Check whether Able to Insert a new slide in the existing powerpoint file using newslide option in home menu ❖ Check whether Able to Insert a new slide in the existing powerpoint file using slide layout option in home menu
15.	Create a simple Power point presentation for a small topic and	✚ Able to create a simple Power point presentation for a given topic ✚ Able to Save the presentation in	❖ Check Able to create a simple Power point presentation for a given topic ❖ Check Able to Save the presentation in both .ppt or pptx format

	saving in .ppt or pptx format	both .ppt or pptx format	
16.	Inserting chart or image in a powerpoint slide	Able to Insert chart in a power point slide using Insert menu option Able to Insert image in a power point slide using insert menu option	❖ Check Able to Insert chart in a power point slide ❖ Check Able to Insert image in a power point slide
17.	Exercise with animation and sound features in powerpoint	Able to work with animation and sound features in power point using custom animation option in Animations menu Able to work with Media clip options in insert menu	❖ Check Able to work with animation and sound features in power point using custom animation option in Animations menu ❖ Check Able to work with Media clip options in insert menu
18.	Exercise with Rehearse Timings feature in powerpoint	Able to work with Rehearse Timings feature in powerpoint using slide show menu rehearse option	❖ Check able to work with rehearse timings features
19.	Exercise in printing the powerpoint file in (a) Slides (b) Handout	Able to print the powerpoint file in Slides using File menu Print option Able to print the powerpoint file in Handout using file menu print option	❖ Check to print the powerpoint file in Slides using File menu Print option ❖ Check to print the powerpoint file in Handout using file menu print option

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING

C-16, SCHEME 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:								
EE- 301	Engineering Mathematics - III	4	-	60	3	20	80	100
EE -302	Electric circuits	5	-	75	3	20	80	100
EE -303	Power systems-I (Generation)	4	-	60	3	20	80	100
EE-304	DC Machines	4	-	60	3	20	80	100
EE-305	Electrical & Electronic Measuring Instruments	4	-	60	3	20	80	100
EE-306	Electronics Engineering	5	_	75	3	20	80	100
PRACTICAL:								
EE-307	DC Machines Laboratory Practice	-	3	45	3	40	60	100
EE-308	Communication Skills and Life Skills	-	4	60	3	40	60	100
EE-309	Circuits and Measurements Lab	-	6	90	3	40	60	100
EE-310	Electronics Lab	-	3	45	3	40	60	100
	TOTAL	26	16	630		280	720	1000

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING
C-16, 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:								
EE - 401	Engineering Mathematics-IV	4		60	3	20	80	100
EE - 402	A.C. Machines - I	5		75	3	20	80	100
EE - 403	Power Systems – II (T&D)	5		75	3	20	80	100
EE - 404	Electrical Installation and Estimation	4		60	3	20	80	100
EE - 405	Digital Electronics and Microcontrollers	5		75	3	20	80	100
EE - 406	General mechanical Engineering	4		60	3	20	80	100
PRACTICAL:								
EE - 407	Electrical Engineering Drawing	-	6	90	3	40	60	100
EE - 408	Digital Electronics and Microcontrollers Lab	-	3	45	3	40	60	100
EE - 409	A.C. Machines-I Lab	-	3	45	3	40	60	100
EE - 410	Programming Lab in C Lab		3	45	3	40	60	100
TOTAL		27	15	630		280	720	1000

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING
C-16, 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:								
EE-501	Electrical Management and Entrepreneurship	4	-	60	3	20	80	100
EE-502	A.C. Machines - II	5	-	75	3	20	80	100
EE-503	Power Systems – III (Switch Gear and Protection)	4	-	60	3	20	80	100
EE-504	Power Electronics	4	-	60	3	20	80	100
EE-505	Electrical drives and Traction	5	-	75	3	20	80	100
EE-506(A)	Electrical utilization Automation	5	-	75	3	20	80	100
EE-506(B)	Electrical utilization and Maintenance	5	-	75	3	20	80	100
PRACTICAL:								
EE-507	Electrical CAD & PLC Lab	-	3	45	3	40	60	100
EE-508	Power Electronics	-	3	45	3	40	60	100
EE-509	A.C. Machines-I I Lab	-	6	90	3	40	60	100
EE-510	Project work	-	3	45	3	40	60	100
TOTAL		27	15	630		280	720	1000

DIPLOMA IN ELECTRICAL& ELECTRONICS ENGINEERING
C-16, SCHEME OF INSTRUCTIONS AND EXAMINATIONS
EE-601-INDUSTRIAL TRAINING

VI Semester

S.NO	SUBJET	DURATION
1	EE-601	6 Months

ENGINEERING MATHEMATICS – III
(Common to all Branches)

Subject Title : Engineering Mathematics-III
Subject Code : EE- 301
Periods per week : 04
PeriodsperSemester : 60

Blue print

OBJECTIVES

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	32	2	2	0	1	1	0
	Unit - II								
2	**Definite Integration and its applications**	17	31	0	1	1	1/2	1	1
	Unit - III								
3	**Numerical Integration**	05	10	0	0	0	0	0	1
	Unit - IV								
4	**Differential Equations of first order**	20	37	2	2	0	1/2	1	1
	Total	60	110	4	5	1	2	3	3
			Marks:	12	15	3	20	30	30

R: Remembering type 32 marks
U: Understanding type 45 marks
App: Application type 33 marks

Upon completion of the subject the student shall be able to

Unit-I

1.0 Use IndefiniteIntegration to solve engineering problems

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

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

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

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

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

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

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

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

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

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

1.7 Evaluateintegrals of powers of *tan x* and *sec x*.

1.8 Evaluate the Standard Integrals of the functions of the type

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

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

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

1.9 Evaluate the integrals of the type

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

1.10 Evaluate integrals using decomposition method.

1.11 Evaluate integrals using integration by parts with examples.

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

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

Unit-II

2.0 Understand definite integral and use it in engineering applications

2.1 State the fundamental theorem of integral calculus

2.2 Explain the concept of definite integral.

2.3 Calculate the definite integral over an interval.

2.4 State various properties of definite integrals.

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

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

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

2.8 Obtain the volumes of solids of revolution.

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

Unit –III

3.0 Understand Numerical Methods

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

Unit –IV

4.0 Solve Differential Equations in engineering problems.

4.1 Define a Differential equation, its order, degree

4.2 Form a differential equation by eliminating arbitrary constants.

4.3 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.)

4.4 Solve simple problems leading to engineering applications

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.

Unit-III

Numerical Integration :

3 Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a definite integral.

Unit –IV

Differential Equations:

4. 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.

Reference Books:

1. Integral Calculus Vol.I, by M.Pillai and Shanti Narayan
2. Thomas' Calculus, Pearson Addison –Wesley Publishers

ELECTRICAL CIRCUITS

Subject Title : Electrical Circuits
Subject code : EE-302
Periods/Week : 05
Periods/semester : 75

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Short Questions	Essay Questions
1.	D.C Circuits	**12**	**26**	**02**	**02**
2	Network Theorems	**11**	**13**	**01**	**01**
3	Fundamental of A.C.	**13**	**19**	**03**	**01**
4	Single phase A.C. circuits	**19**	**26**	**02**	**02**
5	Parallel circuits	**8**	**13**	**01**	**01**
6	Poly phase circuits	**12**	**13**	**01**	**01**
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

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

1.0 Understand Kirchoff's laws and star delta Transformations.

1.1 Differentiate between active and passive circuits.
1.2 Explain junction, branch and loop in circuits
1.3 Understand the insufficiency of Ohm's law to solve complex circuits.
1.4 State Kirchoff's current law and voltage law.
1.5 Solve problems by applying KVL and KCL
1.6 Explain star and delta circuits
1.7 Explain the concept of circuit transformation and equivalent circuits
1.8 Develop transformation formulae for star- delta transformations
1.9 Solve problems on the above

2.0 Understand Network Theorems

2.1 Explain ideal voltage source & ideal current source
2.2 Explain Source transformation technique
2.3 State Super position theorem.
2.4 State Thevenin's theorem.
2.5 State Norton's theorem
2.6 State maximum power transfer theorem.
(All the theorems with reference to D.C only)
2.7 Solve simple problems on the above theorems

3.0 Comprehend the relationship between quantities connected with alternating current

3.1 Define the instantaneous value, maximum value, frequency, time period, Average value, R.M.S value, form factor and peak factor.
3.2 Calculate the above for different alternating waveforms viz. half, full wave

rectified sine, triangular and square wave forms.

3.3 Explain the terms phase and phase difference(No problems).

3.4 Understand j operator.

3.5 Convert polar quantities to rectangular quantities and Vice-versa.

4.0 Comprehend the single phase A.C. Series circuits

4.1 Define the terms resistance, inductance and capacitance

4.2 Derive relationship between voltage and current in pure resistive, inductive and capacitive circuits

4.3 Calculate the impedance, current, phase angle, power and power factor in R-L, R-C, L-C & R-L-C series circuits.

4.4 Solve Problems on Series Circuits

4.5 Define Resonance in series circuits derive resonant frequency.

4.6 Define Q- factor and explain importance of Q-factor.

4.7 Solve simple problems on Series Resonance.

5.0 Comprehend the single phase A.C. Parallel Circuits

5.1 Solve Parallel Circuits by
a) Vector method
b) J- notation method

5.2 Solve Problems on above (a)and(b).

5.3 State condition for resonance in parallel circuits.

6.0 **Understand Poly Phase Circuits**

6.1 Define the term `Poly Phase'.

6.2 Explain the methods of generation of 2 phase and 3 phase emfs.

6.3 Write the expressions for Poly phase emfs and represent them by phasor diagram.

6.4 Understand the concept of phase sequence.

6.5 Derive the relation between line and phase values of current and voltage in 3 phase star and delta circuits.

6.6 Derive the equation for power in 3 phase circuit.

6.7 Solve numerical examples in balanced loads.

6.8 State the advantages of 3 phase system over single phase system.

COURSE CONTENT

1. Kirchoff's Laws and Star - Delta Transformation

Active and Passive circuits - Junction, branch and loop in circuits -Insufficiency of Ohm's law to solve complex circuits, Kirchoff's laws - Star - Delta configurations, star-delta transformations .

2. **Network Theorems**

Ideal Voltage , Ideal current source - Source transformation technique- Super position theorem- Thevenin's Theorem -Norton's Theorem- Maximum power transfer theorem with reference to D.C.-Problems on the above.

3.Fundamentals of A.C.

Defination of Alternating quantity, cycle, period, frequency, amplitude, instantaneous value and angular velocity **-** Average value - effective value/R.M.S value definitions and derivations - calculations of these values for half wave rectified sine wave, full wave rectified Sine wave, Triangular and Square wave forms-form factor- peak factor **-** Representation of alternating quantities by equation, graphs and phasor diagrams **-** Phase and phase difference **–** Undestanding of `J' notation for alternating quantities ,transformation from polar to rectangle notations and Vice-versa

4.Single phase A.C. Series Circuits

Resistance, inductance and capacitance as circuit elements - concept of reactance, resistive, purely inductive and purely capacitive circuits - Derivation of voltage , current, power relations including phase relationships, wave forms and phasor diagrams **-** R-L, R-C , L-C & R-L-C series circuits - Derivation of relation between voltage, current, impedance, power including wave forms and phasor diagrams. Impedance triangle, phase angle, power factor, active and reactive components of current and power in above circuits – Definition of Resonance in series circuits and expression for resonant frequency- Q-factor-Importance of Q- factor- Problems on series circuits and series resonance.

5.Single phase A.C. Parallel Circuits

Simple Parallel circuits - solution by vector method and by `J' notation – problems **-** Resonant circuit – Condition for resonance in parallel circuit.

6.Poly phase circuits

Definition of Poly phase - Generation of 2 phase and 3 phase EMF's - Location of coils for obtaining required phase difference - Representation of 2 phase,3 phase EMF's by equations, graphs and phasors - phase sequence **-** Current in neutral in 2 phase and 3 phase system - Method of connection – star and delta - phasor diagram showing relation between phase and line quantities, Relation between phase and Line values of voltages and currents -power equation - Problems on 3 phase balanced circuits – Advantages of poly-phase systems over single-phase systems.

REFERENCES

1. Electrical Technology - Vol - I by B.L. Theraja- S.Chand &co.
2. Introduction to Electrical Engg. By V.K.Mehta
3. Electrical Technology by Hughes.
4. Problems in Electrical Engg. By Parker Smith
5. Engineering Circuit analysis By William Hayt and JackE,kemmerly-TMH
6. Electrical Circuits by A.Chakrabarthy- Dhanapat Rai and Sons
7. Network and Systems by D. Roy Chowdary- New age international publishers

8. Electric Circuit Theory by K. Rajeshwaran- Pearson educations,2004
9. Network Analysis by Vanvalkanburg, PHI.
10. Electrical Circuits by Joseph Edminister- Schaum series
11. Fundamentals of Electric circuits – Alexander Sadiku- TMH
12. Electric circuits by Mahmood Nahvi, Joseph A Edminister-TMH.

POWER SYSTEMS – I

Subject Title : POWER SYSTEMS – I (GENERATION)

Subject Code : EE – 303
Periods / Week : 04

Periods / Semester : 60

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Sources of Energy	**04**	**06**	**02**	**-**
2.	Thermal Power Station	**12**	**16**	**02**	**01**
3.	Hydro Electric Power Station	**14**	**23**	**01**	**02**
4.	Nuclear Power Station	**08**	**16**	**02**	**01**
5.	Renewable Energy sources	**10**	**23**	**01**	**02**
6.	Combined Operation and Economics of power stations	**12**	**26**	**02**	**02**
	Total	**60**	**110**	**10**	**08**

OBJECTIVES:

Upon completion of the course the student shall be able to

1.0 Appreciate the various sources of power generation.

1.1 List the different sources of energy

1.2 Classify the sources of energy into conventional and non-conventional types.

1.3 State necessity of developing non-conventional methods of power generation.

1.4 Explain the method of generating electrical energy from (i) Solar Power (ii) Tidal Power (iii) Wind Power(iv)Biomass.(v)Geo-thermal power

1.5 State the relative merits and limitations of Conventional and Non-Conventional types of sources.

1.6 State the need of energy conservation.

1.7 List the different methods of energy conservation.

2.0 Comprehend the working of thermal power station.

2.1 List the thermal power stations in South India with their location and their capacity.
2.2 Explain the general principle of working of thermal power stations.
2.3 List the requirements for setting up of Thermal Power Station.
2.4 Mention the requirement for site selection of thermal power plant.
2.5 Draw the detailed line diagram of a condensing type thermal power station.

2.6 Explain the principle of working of each component of thermal power station.

2.7 Describe the energy losses occurring in thermal power plant

2.8 State the methods to improve the efficiency of thermal power plant.

2.9 Define i)Pulverization

ii)Condensation

2.10 Mention the advantages of i)Pulverization ii)Condensation

2.11 State the necessity of cooling towers in thermal power plant

2.12 List the types of cooling towers in thermal power plants.

2.13 List the controls used at i) Boilers, ii) Turbines,(iii) Alternators.

2.14 Explain the concept of Energy Auditing

2.15 State the need of Energy Auditing

2.16 List the methods. of Energy Auditing

2.17 Mention the causes of pollution

2.18 List the methods to control Pollution.

3.0 Comprehend the working of hydroelectric power stations.

3.1 List the Hydel power stations in South India with their location and their capacity
3.2 Explain the principle of working of Hydro power station.
3.3 List the requirements for setting up of Hydro Electric Power (HEP).Station.
3.4 Mention the requirement and factors for site selection of Hydro Electric Power Plant.
3.5 Explain Hydrograph.

3.6 Derive waterpower equation
3.7 Define various hydraulic terms used
3.8 Solve numerical problems on waterpower equation
3.9 Classify the H.E.P's based upon
i) head ii) duty iii) location and iv)hydraulic considerations.

3.10 Explain with layout diagram working of the following Power Stations
ii) High Head, ii) Medium Head, iii) Low Head .

3.11 State the need of i) Surge Tank, ii) Fore bay, iii) Spill gates.

3.12 Explain the working of i) Surge Tank ii) Fore bay iii) Spill gates.

3.13 List the main controls used at i)Head works ii) Turbine iii) Alternators.

4.0 Comprehend the working of Nuclear Power Stations.

4.1 State the importance of nuclear energy
4.2 Explain fission and fusion reactions.
4.3 State the merits of using nuclear energy
4.4 List the various risks involved in using nuclear energy
4.5 Mention the various nuclear fuels used in nuclear power station by giving their properties.
4.6 Give specific examples of fission and fusion reactions with mass-energy balance.
4.7 Explain types of fission reactions and sustained chain reaction.
4.8 Explain use of moderator in nuclear reactions.
4.9 List the types of reactors used in Nuclear power stations.
4.10 Explain the working of reactors in Nuclear power stations
4.11 State the merits and demerits of reactors in Nuclear power stations.
4.12 Explain the working of a moderate type nuclear power station with a block diagram.
4.13 Mention the materials used for i) coolant ii)reflector iii)control rods
4.14 State the need of i) coolant ii)reflector and iii)control rods.
4.15 Explain the working of i) coolant ii)reflector and iii)control rods.
4.16 Explain the mechanism of power control by control rods.
4.17 Explain the measures to control radio activity.
4.18 List the main controls at the reactor

5.0 Comprehend the power generation through Renewable Energy Sources

5.1 State the importance of Renewable energy sources.

5.2 List the various Renewable and Non-Renewable energy sources.

5.3 State the amount of solar radiation reaching the earth's surface.

5.4 State the principle of conversion of solar radiation into heat.

5.5 Explain the function of flat plate collector.

5.6 Explain the working principle of solar air heater with legible sketch

5.7 Identify different types of concentrating collectors.

5.8 Explain the working principle of concentrating collectors

i)focusing type ii)parabolic iii) trough collector.

5.9 State the different methods of storing solar energy.

5.10 a) State the principle of photo-voltaic conversion

b) State the principle of solar thermal power generation

5.11 Comprehend the solar photo-voltaic arrays.

5.12 State the working principle of solar cell.

5.13 Explain the energy conversion of solar cell.

5.14 Describe the current voltage characteristics of solar cell.

5.15 Mention the power available in the wind and the force caused by it on the blades.

5.16 State the collection of wind data and estimate the energy.

5.17 State the different considerations for site selection for installing wind mill.

5.18 List the basic components of a wind mill.

5.19 Describe the construction details of the wind mill.

5.20 Explain the working principle of the wind mill

6.0 Appreciate the combined operation and economics of power stations.

6.1 State the need for reliability of electrical energy.

6.2 Differentiate between isolated operation and integrated operation of power stations.

6.3 List the merits of integrated operation.

6.4 Explain the process of integrated operation and need for grid at various levels

6.5 List the voltage levels.

6.6 List the various Charges and expenses in power station

6.7 Classify the Charges as fixed and running.

6.8 Define the terms i)load curve ii)load factor

iii)diversity factor iv) maximum demand.

6.9 Discuss the effects of load factor and diversity factor on the cost of generation

6.10 Solve numerical problems on the above.

6.11 Explain various types of consumer tariffs and compare them.

6.12 Solve numerical problems on the above.

6.13 Discuss the effects of P.F on electricity charges

6.14 Mention the methods to improve Power Factor.

6.15 Solve numerical problems on electricity charges

6.16 Discuss the need for energy management.

COURSE CONTENT

1. Introduction

Different sources of energy - Conventional and Non-conventional sources - Need for Non-Conventional Energy based power generation - Methods of generation of energy from different sources of power such as Solar, Wind, Tidal, Bio-mass and Geo-Thermal - Merits and Limitations of Conventional and Non-conventional sources - Need for energy conservation and their methods.

2. Thermal Power Station

Thermal Power Station - Principle of working - Factors for selection of site. Block diagram of condensing type thermal power station - Thermal power station - Components and principles of working - Energy Losses and methods to improve the efficiency- pulverization, Condensation, Cooling towers and their types - Main controls at Boilers, Turbines and Alternators - Energy auditing of thermal power station - Causes of pollution and methods to control them.

3. Hydroelectric Power Stations

Hydro Electric Power Station - Factors for site selection and limitations in location and operation – Hydraulic terms used - Water power equation - Classification of hydroelectric power stations based on head, duty, location and hydraulic considerations - Layout diagram of High Head ii) Medium Head iii) Low Head Power Stations - Working of surge tank, fore bay, spill gates- Main controls of head works, turbines and alternators.

4. Nuclear Power Stations

Nuclear energy, fission and fusion reactions - Merits and risks in using nuclear energy. Nuclear fuels and their properties - Fission and fusion reactions with mass-energy balance, Fission reactions and sustained chain reaction - Moderator in nuclear reactions - Working of reactors with merits and demerits - Working of moderated type nuclear power station with a block diagram - Need and working of coolant, reflector, control rods – Materials used for them - Power control by control rods- measures to control radioactivity- main controls at the reactor.

5. **Renewable Energy sources**

Solar radiation - Principle of Conversion of solar radiation into heat - Function of flat plate collector - Working principle of Solar air heater - Different types of concentrating collectors and working of it-methods of storing solar energy - Principle of photo voltaic conversion – principle of solar thermal power generation-Applications-Solar photo voltaic arrays - Working principle of solar cell - VI-Characteristics of Solar cell - Power available in wind - Wind data-energy estimation -Site selection for installing Wind mill-basic components, constructional details and working principle of wind mill.

6. Combined Operation and economics of Power Stations

Isolated operation and integrated operation of power stations - Their merits and limitations - Charges/Expenses involved in power station - Their classification as fixed and running - Load curve, load factor, diversity factor and maximum demand - Effects of load factor and diversity factor in power generation - Solve numerical problems. Consumer tariffs and their comparison - Effect of power factor on the electricity charges and methods to improve it - simple problems - Energy management and conservation.

REFERENCES

1. S.L.Uppal-Electrical Power
2. Soni,Guptha,Bhatnagar-Electrical Power Systems – DhanpatRai & Sons
3. A.T.Starr -Generation, Transmission and Utilisation
4. C.L.Wadhwa -Electrical Power Systems - New age international(P) limited
5. NEDCAP -Non Conventional Energy Guide Lines
6. J B Guptha -Electrical power plants
7. G.D. Roy Non conventional energy sources
8. S.Rao and D.B.Palekr -Energy technology- Nonconventional and Conventional
9. Raja.-Introduction to Non Conventional energy resources
10. B H khan -Non Conventional energy resources - Mc Graw Hill
11. Meinel A B and Meinal M P,Addison -Applied Solar Energy- Wesley Publications
12. S L Sah Renewable and novel energy sources-. MI Publications, New Delhi.
13. George Sutton -Direct Energy Conversion –- Mc Graw Hill

D.C. MACHINES

Subject Title	:	D.C. Machines
Subject Code	:	EE - 304
Periods/Week	:	04
Periods/Semester	:	60

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Short Questions	Essay Questions
1.	Fundamentals of D.C Generators	15	29	03	02
2.	Armature Reaction and Characteristics and applications of D.C Generator s.	13	26	02	02
3.	Fundamentals of D.C Motors	12	26	02	02
4.	Speed Control and Starters for D.C Motors	10	16	02	01
5.	Testing of D.C Motors	10	13	01	01
	TOTAL	60	110	10	08

OBJECTIVES

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

1.0 Fundamentals of D.C Generators

1.1 State the method of dynamically induced E.M.F.

1.2 Fleming's right hand rule.

1.3 Electromechanical energy conversion.

1.4 Explain the working of simple loop generator.

1.5 Principle of working of D.C generator.

1.6 State the functions of each part of D.C generator with neat sketches.

1.7 Explain the working of D.C Generator.

1.8 Types of windings — (i) Lap (ii) Wave.

1.9 Classification of generators based on excitation.

1.10 Derive the E.M.F equation of D.C generator.

1.11 Voltage and Current equations for different types of D.C Generators.

1.12 State the losses incurred in the D.C machines.

1.13 Explain power stages in D.C. machine

1.14 Problems on the above.

2.0 Armature Reaction and Characteristics of D.C Generators.

2.1 State and explain the Armature reaction with sketches.

2.2 Explain the phenomenon of Demagnetization & Cross magnetization. 2.3 Derive the formula for ATd , ATc / Pole. 2.4 Solve the simple problems on ATd , ATc / Pole 2.5 State and explain Commutation.

2.6 State the methods of improving commutation and explain inetrpole method.

2.7 O.C.C, internal and external characteristics of

(i) Separately excited (ii) Shunt

(iii) Series (iv) Compound generators.

2.8 State the conditions for (i) Building up (ii) Non building up of E.M.F.

2.9 Calculation of Critical field resistance and critical speed fromO.C.C

2.10 Explain the necessity of parallel operation.

2.11 Conditions for parallel operation of generators. (No- Problems)

2.12 Use of Equalizer ring in parallel Operation.

2.13 Applications of D.C generators.

2.14 Explain the working of welding Generator.

3.0 Fundamentals of D.C Motors

3.1 State and explain Fleming's left hand rule.

3.2 Explain the working of D.C motors and classify them.

3.3 Explain the significance of back E.M.F and its formula.

3.4 Write the formulas for back E.M.F for different D.C motors.

3.5 Problems on E.M.F equation.

3.6 Torque equation of D.C motor. 3.7Develop the formulas for armature torque (Ta) , shaft torque (Tsh) and loss torque.

3.8 State the different losses in D.C motors and explain power stages in D.C. motor.

3.9 Problems on the above.

3.10 Explain and plot the electrical and mechanical characteristics of D.C Shunt, Series and compound motors.

3.11 Applications of D.C motors.

4.0 Speed Control and Starters for D.C Motors

4.1 Explain the necessity of speed control of DC Motors.

4.2 Explain the different methods (Flux, Armature and Voltage) of speed controls for D.C shunt motors.

4.3 State the advantages and disadvantages of above methods.

4.4 Explain the different methods of speed control for series motors

4.5 Explain the necessity of starter.

4.6 Explain 3-point starter with neat sketch.

4.7 Explain 4-point starter with neat sketch.

4.8 Drum controlled starter for Series Motor.

5.0 Characteristics and Testing of D.C Motors

5.1 State and explain the different performance curves.

5.2 Explain the method of conducting brake test on different types of D.C motors.

5.3 Explain the method of conducting Swinburne's test.

5.4 Explain the method of conducting Hopkinson's test.

COURSE CONTENTS

1. Fundamentals of D.C Generators

Dynamically induced E.M.F- Flemming's right hand rule - electromechanical energy conversion - simple loop generator - principle of D.C generator- functions of each part of D.C generator with neat sketches windings - (i) Lap (ii) Wave -Classification of generators based on excitation- E.M.F equation - losses incurred in the D.C machines-Problems on E.M.F equation -Voltage and Current equations for different types of D.C Generators - simple problems.

2. Armature Reaction and Characteristics of D.C Generators

Armature reaction, Demagnetization & Cross magnetization-Derive for ATd, ATc / Pole.,- simple problems –Commutation - methods of improving commutation – Method of improving Commutation by Interpole method O.C.C, internal, external characteristics of Separately excited, Shunt, Series and Compound generators- Conditions for (i) Building up (ii) Non building up of E.M.F.- Critical field resistance and critical speed from O.C.C - parallel operation of generators - Applications of D.C generators – Welding Generator.

3.Fundamentals of D.C Motors

Fleming's left hand rule - working of D.C motors – classification - significance of back E.M.F. Write the formulas for back E.M.F for different D.C motors-Problems on E.M.F equation - Torque equation - Armature torque (Ta) , shaft torque (Tsh) and loss torque – Problems on Torque- Different losses –Problems on losses electrical and mechanical characteristics of D.C Shunt, Series and compound motors. Applications of D.C motors.

4.Speed Control and Starters for D.C Motors

Necessity of speed control- different methods (Flux, Armature and Voltage) of speed controls for D.C shunt motors-State the advantages and disadvantages of above methods-different methods of speed control for series motors- problems -necessity of starter- 3-point starter, 4-point starter, Drum Controlled starter.

5.Testing of D.C Motors

Performance curves- brake test on different types of D.C . Motors Swinburne's Test - Hopkinson's test - Problems

REFERENCES

1. B.L. Theraja -Electrical Technology - Vol - I - S.Chand&co.
2. B.L. Theraja -Electrical Technology - Vol -II - S.Chand&co.
3. P.S. Bhimbhra -Electrical machines
4. M.V.Deshpande -Electrical Machines
5. D.P.Kothari, J.Nagarath - Electric Machines- TMH

ELECTRICAL & ELECTRONIC MEASURING INSTRUMENTS

Subject Title :Electrical & Electronic Measuring Instruments

Subject Code : EE – 305

Periods/Week : 04

Periods/ Semester : 60

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1	Basics of Measuring Instruments	08	11	02	1/2
2	Electromechanical Measuring Instruments -I	12	23	01	02
3	Electromechanical Measuring Instruments -II	10	23	01	02
4	Measurement of Resistance	08	16	02	01
5	Transducers and Sensors	10	16	02	01
6	Electronic & Digital Instruments	12	21	02	11/2
	TOTAL	60	110	10	08

OBJECTIVES

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

1.0 Comprehend the Basics of measuring instruments.

1.1 List any six important electrical quantities to be measured by giving their units
1.2 Mention the names of the instruments to measure the various electrical quantities..
1.3 Classify instruments on the basis of construction and output as analog (electromechanical and analog electronic) and digital instruments .

1.4 Classify the electromechanical instruments according to Principle of Working.

1.5 Classify the instruments on the basis of method of measuring the value as absolute and secondary instruments

1.6 Distinguish between Absolute and Secondary instruments

1.7 State the types of secondary instruments (indicating, integrating and recording).by giving suitable examples.

1.8 State the purpose of obtaining deflecting, controlling and damping torques in indicating instruments.

1.9 Explain the methods of obtaining i) deflecting torque ii) controlling torque and iii) damping torque in indicating instruments.

1.10 Define the following terms related to measuring Instruments

i) accuracy ii) precision iii) error iv) resolution v) sensitivity

1.11 Classify the errors according to its source (gross, systematic and random)

2.0 Explain the construction and working of different Electromechanical Measuring instruments.

2.1 Describe the construction of Permanent Magnet Moving Coil Instrument.

2.2 Explain the working of Permanent Magnet Moving Coil Instrument (Voltmeter/Ammeter) .

2.3 Solve simple problems on deflecting torque $T_d = NBIA$

2.4 List the three types of errors commonly occurring in moving coil (M.C.) instruments

2.5 Mention the remedies for the commonly occurring errors in M.C instruments

2.6 State advantages and disadvantages of M.C Instruments.

2.7 List the applications of M.C Instruments

2.8 Describe the construction and working of Moving Iron (M.I)

i) Attraction type Instrument ii)Repulsion type Instrument.

2.9 List the errors commonly occurring in M.I. Instruments.

2.10 State the advantages and disadvantages of M.I. Instruments.

2.11 Compare M.C. and M.I. instruments.

2.12 Describe the method of extending the range of moving coil ammeter with the help of shunt.

2.13 Describe the method of extending the range of moving coil voltmeter with the help of Multiplier.

2.14 Solve the problems on Shunts and Multipliers used for moving coil instruments.

2.15 Describe the construction of a dynamometer type instrument

2.16 Explain the working of a dynamometer type Instrument.

2.17 Draw the circuit diagram for measuring power with wattmeter in a Single – Phase circuit.

2.18 List the common errors in the Dynamometer Instruments.

2.19 List the advantages and disadvantages of dynamometer instruments

3. 0 Explain the construction and working of different Electromechanical Measuring instruments

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3.1 State the need for instrument transformers (Current Transformer – CT and Potential Transformers - PT).

3.2 List the applications of CT and PT.

3.3 State the precaution when using CT.

3.4 Draw the circuit diagram for measuring power with wattmeter in Single – Phase circuit in conjunction with instrument transformers.

3.5 Describe the construction of a 1-phase induction type Energy meter

3.6 Explain the working of a 1-phase induction type Energy meter.

3.7 State Meter Constant

3.8 State the common errors and their remedies in 1- phase energy meter

3.9 Describe construction and connections of a 3-phase energy meter.

3.10 Describe the construction of Weston synchroscope.

3.11 Explain the working of Weston synchroscope

4.0 Explain the methods of measurement of resistance.

4.1 Classify the resistance into Low, Medium and High Values giving examples for each.

4.2 List the methods of measurement of

i) Low resistance ii) Medium resistance and iii) High resistance

4.3 Draw the circuit diagram of basic Ohm-meter.

4.4 Explain the working of basic Ohm-meter.

4.5 Describe the two types of Ohm-meters (series and shunt).

4.6 Distinguish between shunt and series Ohm-meters

4.7 Describe the construction of Megger.

4.8 Explain the working of Megger

4.9 Explain the method of measurement of earth resistance using Earth Megger.

(Construction and Working of Earth Megger is **not** required).

4.10 State the working principle of basic Potentiometer.

4.11 Describe the Construction of basic Potentiometer with a legible sketch

4.12 Explain the working of basic Potentiometer with a legible sketch

4.13 Explain the measurement of unknown resistance using Potentiometer.

4.14 List the applications of Potentiometer.

5.0 Explain the concept of Transducers and Sensors

5.1 Define Transducer

5.2 State the need of Transducers in Measurement systems

5.3 Classify Transducers

i)based on the principle of transduction form used

ii) as Primary and Secondary iii).as Passive and Active

iv) as Analog and Digital and v) as Transducers and Inverse Transducers

5.4 Explain the factors influencing the choice of Transducer

5.5 State the applications of Transducers.

5.6 Explain the use of Thermocouple for the measurement of temperature.

5.7 Explain the measurement of temperature using Thermister in a Bridge circuit.

5.8 State the working principle of strain gauge.

5.9 Describe the construction of Linear Variable Differential Transformer(LVDT).

5.10 Explain the working of LVDT .

5.11 State the advantages and Disadvantages of LVDTs.

5.12 Explain the concept of Sensor

5.13 List the applications of sensors.

5.14 Explain Semiconductor sensors.

6.0 Understand the working of Electronic & Digital instruments

6.1 List the basic components of analog electronic Instruments.

6.2 List analog electronic Instruments.

6.3 Explain the working of Rectifier type voltmeter and ammeter.

6.4 List the basic components of Digital (Digital electronic) instruments.

6.5 List the advantages of Digital Instruments over Analog Instruments.

6.6 List the types of digital Voltmeters.

6.7 Mention the specifications of digital voltmeter.

6.8 Explain the Working of Digital Multi meter by giving its specifications.

6.9 Explain the Working of Single Phase Digital Energy meter with block diagram.

6.10 Explain the Working of Three Phase Digital Energy meter with block diagram.

6.11 Explain the Working of Digital frequency meter with block diagram.

6.12 State the uses of Tong tester (clamp meter).

COURSE CONTENT

1. **Basics of Measuring instruments:**

List of important electrical quantities to be measured, their units and the names of the Instruments to measure them- Classification of instruments - different types of torques (Deflection, Controlling and Damping torques) in the indicating instruments-definitions of Accuracy, precision, error, resolution and sensitivity-types of error.

2. **Electromechanical Measuring Instruments-I**

M.C. and M.I types of Ammeters and Voltmeters - their Construction and working, errors, comparison- shunts and multipliers for M.C instruments – problems on shunts and multipliers for M.C instruments - Dynamometer type Ammeter, Voltmeter and Wattmeter –construction, working, and errors in them

3. **Electromechanical Measuring Instruments -II**

- use of Instrument transformers- Measurement of energy –single phase Induction type energy meter- Construction and working, error and adjustments construction and connections of a 3-phase energy meter- Construction and working of Weston Synchroscope.

4. Measurement of resistance:

Classification of resistance- List of methods of measurement of resistance- explanation of basic Ohm meter circuit – difference in series and shunt type ohmmeters- Construction and working of megger – method of measuring earth resistance using earth Megger – working principle, construction and applications of Potentiometer.

5. Transducers and Sensors:

Definition of transducer-need of transducer-Classification of Transducers - Factor

influencing while its selection -Applications of Transducers –Thermocouple- Thermister - working principle and use of Strain Gauge- construction, working and use of LVDT- Basic Concept of Sensors and its applications –Semiconductor sensors .

6. Electronic & Digital Instruments:

Basic components of analog electronic Instruments - Working of Rectifier type Voltmeter and Ammeter- basic components of Digital (Digital electronic) instruments- advantages of Digital Instruments over Analog Instruments- types of digital Voltmeters- specifications of digital voltmeter -working of digital multi meter and its specifications- working of single phase digital energy meter with block diagram-- working of three phase digital energy meter with block diagram- Working of Digital frequency meter with block diagram-use of tong tester(clamp meter).

References:

1. A. K.SAWHNEY -Electrical and Electronic measuring instruments –- Dhanpat Rai &Sons.
2. E.W. Golding and F.C. Widdis, Electrical Measurements and measuring instruments –Wheeler publishers.
3. David A Bell -Electronic Instrumentation and Measurements– Oxford.
4. B. L. Theraja -Electrical Technology —– S.Chand &Co.
5. Khandpur -Modern Electronic Equipment
6. J.B. Gupta -Electrical and Electronic measuring instruments.
7. Harris -Electrical measurements
8. K.B.Bhatia -Study of Electrical Appliances and Devices – Khanna Publishers.

ELECTRONICS ENGINEERING

Subject Title : Electronics Engineering

Subject code : EE-306

Periods/Week : 05

Periods/Semester : 75

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Power supplies	13	17½	02½	01
2.	Special devices	12	17½	02½	01
3.	Transistor Biasing	10	13	01	01
4.	Amplifiers	20	36	02	03
5.	Oscillators	10	13	01	01
6.	CRO and Industrial Timers	10	13	01	01
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

On the completion of the course the student should be able to comprehend the following

1.0 Understand the working Principle of Power supply circuits

1.1 Explain the principle of rectifier Power Supply with a Block diagram

1.2 Explain the working principle of half wave rectifier using P.N. junction diodes with waveforms.

1.3 Explain the working principle of full wave rectifier with centre tapped transformer using P.N. junction diodes with waveforms.

1.4 Explain the working principle of bridge rectifier using P.N. junction diodes with waveforms.

1.5 State the need for filter and List the different types of filters.

1.6 Explain the working principle of half wave rectifier using filter circuits

1.7 Explain the working principle of full wave rectifier with centre tapped transformer using filter circuits.

1.8 Explain the working principle of bridge rectifier using filter circuits

1.9 Explain the operation of Zener diode voltage regulator.

1.10 Explain the operation of adjustable voltage regulator (LM317).

2.0 Understand the Performance of Special Devices

2.1 Explain the construction, working principle and applications of JFET

2.2 Explain the construction, working principle and applications of MOSFETS

2.3 Explain the construction, working principle and applications of UJT

2.4 Explain the construction, working principle and applications of LED

2.5 Explain the construction, working principle and applications of LCD

2.6 Explain the construction, working principle and applications of Photo Diode

2.7 Explain the construction, working principle and applications of Photo Transistor

2.8 Explain the construction, working principle and applications of Solar Cell

2.9 Explain the construction, working principle and applications of Opto Coupler

3.0 Understand the Transistor Biasing .

3.1 Explain the operation of transistor as an amplifier.

3.2 Explain the concept of DC load line.

3.3 Determine the Q point (operating point) on the DC load line.

3.4 State the necessity of proper biasing for a transistor amplifier.

3.5 List the causes for instability of biasing in a transistor amplifier.

3.6 Explain the need for stabilization and define the stability factor

3.7 Explain collector to base biasing method.

3.8 Explain potential divider biasing method.

4.0 **Understand the Working Principle of Amplifiers.**

4.1 Classify amplifiers on the basis of frequency, function, type of load, period of Conduction and Number of stages.

4.2 Draw the practical transistor CE amplifier and explain the function of each component

4.3 Explain the need for Multistage amplifier (Cascading of amplifiers).

4.4 Define the terms gain, decibel gain, frequency response and bandwidth of an amplifier.

4.5 Explain the principle of operation of two-stage RC coupled amplifier with circuit diagram.

4.6 Draw and explain the frequency response of RC coupled amplifier.

4.7 Explain the principle of operation of two-stage transformer coupled amplifier with circuit diagram.

4.8 Draw and explain the frequency response of transformer-coupled amplifier.

4.9 Explain the principle of operation of direct coupled amplifier with circuit diagram.

4.10 Compare different types of coupling.

4.11 List applications of RC coupled, Transformer coupled and direct coupled amplifiers.

4.12 Distinguish between voltage and power amplifier

4.13 Explain the working principle of Class-A power amplifier

4.14 Explain the working principle of complementary push-pull power amplifier

4.15 Define efficiency of power amplifier.

4.16 Explain the effect of feedback on gain, band width, distortion, noise.

4.17 Define feedback factor and draw the Circuit Diagrams of different types of feedback amplifiers

5.0 **Understand the principles of Oscillators.**

5.1 Establish the conditions for sustained oscillations using Barkhausans criteria.

5.2 Classify different types of oscillators

5.3 Explain the working principle of RC phase shift Oscillator

5.4 Explain the working principle of Hartley Oscillator

5.5 Explain the working principle of Colpitts Oscillator

5.6 Explain the crystal oscillator circuit

5.7 Explain the use of Piezo electric Crystal in stabilizing oscillator circuit

5.8 Explain UJT relaxation oscillator

5.9 Mention the different applications of oscillators

6.0 **Cathode Ray Oscilloscope and Industrial Timers**

6.1 Explain the block diagram of a simple CRO

6.2 Sketch the CRT and indicate different parts.

6.3 Describe the functions of different parts of C.R.T.

6.4 List the applications of C.R.O.

6.5 Explain the working principle of function generator with block diagram

6.6 State the need for an industrial timer.

6.7 Draw and explain the internal block diagram of IC 555

6.8 Draw the circuit of simple timer using IC 555

COURSE CONTENTS

1. Power supplies

Half wave, Full wave and Bridge rectifiers - Types of Filters – Zener Voltage Regulator- IC Voltage Regulator,

2. Special Devices

JFET, MOSFET, UJT, LED, LCD, Photo diode, Photo transistor, Solar cell, Opto coupler, - characteristics and their applications.

3. Transistor Biasing

Transistor as an Amplifier - Biasing and stabilization technique-Operating point and Load line Characteristics.

4. Amplifiers

Classification of Amplifiers, Coupling methods, Frequency, Response of R.C-coupled, transformer coupled and Direct coupled-Amplifiers and their applications. Power amplifier- Class A - Complementary push-pull Amplifiers- Feedback

5. Oscillators

Principle of oscillator –operation of RC phase shift, Hartley, Colpitts, Crystal and Relaxation oscillators- Applications.

6. Cathode ray oscilloscope and Industrial Timers

Block diagram of simple CRO- Study of different stages - Constructional features of cathode ray tube - Application of CRO – Function generator- Timer 555.

Reference Books

1. Principles of Electronics by V.K. Mehtha, S CHAND .

2. Basic Electronics and Linear circuits by Bhargava,TMH Publishers.

3. Electronic Principle by Malvino
4. Electronic devices and circuits by Mathur,Chada & Kulakshetra
5. Industrial Electronics by G.K. Mithal
6. Applied electronics by G.K.Mithal
7. Electronic Instruments by David Kooper

DC MACHINES LABORATORY PRACTICE

Subject Title	**:**	**DC Machines Laboratory Practice**
Subject Code	**:**	**EE-307**
Periods/Week	**:**	**03**
Periods/Semester	**:**	**45**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	**Testing and Speed control of DC motors**	**24**
2.	**Characteristics of DC Generators**	**21**

OBJECTIVES:

Upon completion of the Practice, the student shall be able to

TESTING AND SPEED CONTROL OF DC MOTORS

Identify the terminals of the following DC Machines

a) DC Shunt motor

b) DC Series Motor
c) DC Compound Motor.

Study the parts of DC 3 point starter, 4 point starter and Drum Controller Starter.

Obtain performance characteristics by conducting Brake Test on DC Shunt Motor
Obtain performance characteristics by conducting Brake Test on DC Series Motor.

Obtain performance characteristics by conducting Brake Test on DC Compound Motor.
Speed control of DC Shunt Motor by

a) Armature control method

b) Field control method

Obtain the performance of a DC Shunt Motor by conducting Swinburne's test.

CHARACTERSTICS OF DC GENERATORS

Obtain OCC of a DC shunt Generator at rated speeds.

Obtain Internal and External characteristics of DC Shunt Generator.

Obtain Internal and External characteristics of DC Series Generator.
Obtain Internal and External characteristics of DC Compound Generator

Competencies to be achieved by the student

S.No	Experiment title	Competencies
1	Identify the terminals of the following DC Machines (a)DC Shunt motor (b)DC Series Motor (c)DC Compound Motor.	Note down the name plate details. Locate the different terminals of a DC Shunt Motor / DC Series Motor./. DC Compound Motor. Measure the resistance across different terminals using multimeter. Record the resistance values of the terminals. Identify the armature and shunt field / series field resistance according to resistance values observed.
2	Study the parts of DC 3 point, 4 point starter..	Locate the Line, Armature, Field terminals of the starter (L-A-F) Locate NVR coil and OLR coils. Know the purpose of NVR and OLR coils. Properly connect Starter and motor terminals Properly handle the Starter terminals. Properly start the motor.
		Select the proper DC supply voltage Choose the proper range of voltmeter, ammeter and rheostat. Connect the circuit as per the circuit diagram.

3,4,5	Performance characteristics of DC (Shunt ,Series, Compound)Motors. by conducting Brake Test	Ensure that all the instruments are connected in proper polarity. Start the Motor with the starter. Note the readings of speed N, current I and spring balance for a particular load. Pour water in the break drum carefully. Check the speed and maintain it constant by means of field regulator before taking every reading. Note readings by varying loads on the motor upto rated current. Calculate the torque,input, output and efficiency. Draw performance curves of motor
6	Speed control of DC Shunt Motor by (a) Armature control method (b) Field control method	Select the proper DC supply voltage Choose the proper range of voltmeter, ammeter and rheostat. Connect the circuit as per the circuit diagram. Ensure that all the instruments are connected in proper polarity. Handle the 3- point Starter Set the Field Resistance of the motor by gradually moving the knob on the rheostat coil. Record the readings of Ammeter and Tachometer by gradually increasing the resistance in the Field rheostat. Draw the graph speed Vs Field current. Observe the graph and write the conclusions.
	Performance of a DC	Select the proper DC supply voltage Choose the proper range of voltmeter, ammeter and rheostat.

7	Shunt Motor by conducting Swinburne's test.	Connect the circuit as per the circuit diagram. Ensure that all the instruments are connected in proper polarity. keep the rheostat is maximum position in armature so that minimum voltage is applied to armature
		Adjusting the field rheostat to minimum position Adjust the speed of the motor to its rated value by using its Field Rheostat. Taking the readings of Ammeter and Voltage by opening the Field switch Taking the readings of Voltage and current by closing the field switch and gradually decreasing the resistance in the Rheostat. Calculate the efficiency of the DCMachine as a Generator and as a Motor at various loads. Draw the conclusions.
8	OCC of a DC shunt Generator at rated speeds.	Draw the relevant circuit diagram for OCC test. Select the proper DC supply voltage. Choose the proper range of voltmeter, ammeter and rheostat. Make the connections according to circuit diagram. Ensure that all the instruments are connected in proper polarity. Check the speed and maintain it constant by means of field regulator before taking every reading. Observe and note the readings in a tabular form. Draw the graph between I_f Vs E_g .
		Select the proper DC supply voltage Choose the proper range of voltmeter, ammeter and

		rheostat. Connect the circuit as per the circuit diagram. Ensure that all the instruments are connected in proper polarity. Adjust the motor rheostat to minimum position Adjust the Generator rheostat to maximum position
9,10,11	Obtain Internal and External characteristics of DC (Shunt ,Series, Compound) Generator	Adjust the speed of the motor to its rated value Setting the Field Rheostat of the motor. Gradually increase the Load current by operating the Load switches. Measure the terminal voltage. Measure the load current and armature current. Measure the Armature resistance by DC Resistance method. Calculate I_aR_a drop. Draw the graph for External Characteristics Draw the graph for Internal Characteristics Observe the difference between the Graphs of Internal and External characteristics.

REFERENCES

1. Electrical Technology - Vol - I by B.L. Theraja – S.Chand&co.
2. Electrical Technology - Vol –II by B.L. Theraja - S.Chand&co.
3. Electrical machines by P.S. Bhimbhra
4. Electrical Machines by M.V.Deshpande
5. Electric Machines by D.P.Kothari, J.Nagarath – TMH

Communication Skills and Life Skills

(Common to all the branches)

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

Communication Skills

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

8	Interview Skills	• Prepare for an interview • Face an interview	• Get the confidence to face an interview • Learn good body language • Know frequently asked questions and answer them appropriately • Learn to dress for an interview • Know the do's and don'ts

Life Skills

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

Total Marks: 100

Internal: 40 marks

External: 60 marks

End Examination:

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

Internal Assessment:

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

ELECTRICAL CIRCUITS AND MEASUREMENTS LABORATORY

Subject Title : Electrical Circuits and Measurements Laboratory

Subject Code : EE-309

Periods/Week : 06

Periods/Year : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1	Techniques of using statistical tools in drawing and use of Graphs.	03
2	Network Laws & Theorems	30
3	Measurement of resistance	03
3	Calibration of meters	21
4	Measurement of Power	03
5	Report on observations in Industrial visits	30
	TOTAL	90

OBJECTIVES(LIST OF EXPERIMENTS)

1. Techniques of using statistical tools and rules of drawing graphs

2. Verification of Ohm's Law and its limitations

3. a) Verification of Kirchoff's current Law

3. b) Verification of Kirchoff's Voltage law

4. Verification of Super position theorem

5. Verification of Thevenins theorem

6. Measure the Low and Medium resistance by volt-ampere method.

7. Calibration of Dynamometer type of wattmeter

8. Calibration of single phase Energy meter

9. Measurement of power in 3 -Ø balanced circuit by 2-Wattmeter method

10. Measurement of earth resistance using digital earth tester

11. Measurement of insulation resistance using digital insulation tester

12. a) Visit MRT division Electricity Department to understand the testing and repair of various Measuring instruments.- Write a Report on observations.

b) Visit any Electrical / Electronic Measuring Instrument manufacturing industry to observe and understand construction and working of various meters. Write a Report on observations

Note: 1. Every student has to bring insulated tool kit and follow the general safety precautions throughout the lab sessions

2. Whenever handling/using a meter check for 'zero' position of the pointer and adjust for 'zero' position if there is any deviation

Competencies required to be achieved by the student

S.No	Experiment title	Competencies
I	Techniques of using statistical tools and drawing and use of Graphs	• Follow the international standards • Select proper X & Y parameters • Choose proper scale • Analyze the trend of the graph • Correlate trend of the graph with the relation between the parameters
II (2, 3a.3b, 4,5)	Verification of Network Laws & Theorems	• Draw the relevant circuit diagram • Select proper supply and load. • Select proper meters with proper ranges • Select proper wires to make connections as per circuit diagram • Ensure that all the meters are connected with proper polarity • Perform the experiment by carefully following the experimental procedure and precautions • Observe the readings without any scope for errors and tabulate
III (7,8)	Calibration of meters	• Short M & C terminals of wattmeter • Connect for proper Current range. • Calculate Multiplication factor • Calculate P, Error, %Error • Draw graph between W and % Error
9	Measurement of power in 3- Ø circuit using the two wattmeter method	• Short M & C Terminals of wattmeters and connect for proper current coil range • Find out the M.F of Wattmeter • Reverse wattmeter terminals for negative readings (Lead values) • Calculate P, power factor(cos Ø)

10.	Measurement of earth resistance using digital earth tester	• Identify the terminals on the megger • Connect the terminals properly • Identify the resolution of the meter • Know the resistance of the earth at the specified place
11.	Measurement of insulation resistance using digital insulation tester	• Identify the terminals on the megger • Connect the terminals properly • Identify the resolution of the meter • Know the resistance of the insulation of the specific insulation material

ELECTRONICSLABORATORY

Subject Title : ELECTRONICS LABORATORY

Subject code : EE-310

Periods/week : 03

Periods/Semester: 45

TIME SCHEDULE

Sl.No.	**Major Topics**	No of periods
1.	**Diode Characteristics**	**6**
2.	**Zener Diode Characteristics**	**6**
3.	**Filter Circuits**	**6**
4.	**Regulated power supply**	**6**
5.	**NPN Transistor**	**9**
6.	**FET Characteristics**	**6**
7	**Amplifiers & Oscillators**	**6**
	Total	**45**

OBJECTIVES

Upon completion of the Practice, the student shall be able to

1.0 PLOT THE CHARACTERSTICS OF DIODE
1.1 To draw the forward & reverse characteristics of Silicon diode.
1.2 Determine Knee voltage.
1.3 Identify Cutoff , and Linear regions
1.4 Connect a 6V lamp in series with diode and test it on DC power supply
1.5 Using the CRO & Curve tracer to observe the Characteristics.
1.6 Heat the diode with a soldering Iron and observe the effect on reverse current

2.0 PLOT THE CHARACTERSTICS OF ZENER DIODE
2.1 To draw the forward & reverse characteristics of Zener diode and determine Breakdown Voltage
1.2 Connect resistance ladder circuit(3 resistors) and measure the voltages at the output by varying input voltage while Zener is reverse biased.

3.0 IMPLEMENT RECTIFIER CIRCUITS TO OBSERVE THE EFFECT OF FILTER
3.1 Implementing Half wave rectifier with and without filter
3.2 Implementing Full wave rectifier with and without filter
3.3 Implementing Bridge rectifier with and without filter
3.4 Implementing Voltage Doubler circuit
3.5 Connect a diode IN4007 in series with a 60W 230V Lamp and test it .(Record your observations)

4.0 PLOT THE REGULATION CHARACTERISTICS OF A POWER SUPPLY.
4.1 To build a Regulated power supply and draw the regulation characteristics
i) usingZener diode ii) using 3 Terminal +ve Regulator
4.2 Implement a –ve 3 Terminal Regulator and draw the regulation characteristics
4.3 Implement a Dual regulated power supply using both +ve and –ve 3 terminal

regulators and draw the regulation characteristics
4.4 Obtain a voltage above 30V using Dual RPS in the laboratory and measure them.

5.0 PLOT INPUT AND OUTPUT CHARACTERISTICS OF NPN TRANSISTOR
5.1 To draw Input and output characteristics of NPN Transistor and determine Beta of the transistor
a) in CB configuration and b) in CE configuration
5.2 Turn on and turn off a relay using Transistor(BC148 as a switch.)
5.3 Connect a 6v lamp in series with BD139 and observe the effect of base current variation on lamp brightness .
5.4 Know the package and differences between BC148A, 148B, 148C and BF194 from the data sheets.

6.0 OBTAIN THE INPUT AND OUTPUT CHARACTERISTICS OF JFET
6.1 Drain the input and output characteristics of JFET and determine pinchoff voltage and transconductance.
6.2 Show that a FET can be used as a constant current source with appropriate bias
6.3 Apply -2 volts to the gate circuit through resistors of value 10k, 100k and 1M separately and measure the output current and analyse.

7.0 AMPLIFIERS AND OSCILLATORS

7.1 plot the frequency response of two stage RC coupled amplifier

7.2 observe the frequency of RC phase shift oscillator

7.3 observe the frequency of Hartley oscillator and colpit oscillator

Competencies to be achieved by the student

S.No	Experiment title	Competencies
1	Plot the characteristics of diode	1.Assemble the circuit as per the circuit diagram 2.Identify Diode terminals by observation and also with DMM & Analogue Multimeter. 3. Drawing inference and writing the report
2	Plot the characteristics of zener diode	1. Assemble the circuit as per the circuit diagram 2. Identify Zener Diode terminals by observation and with DMM &Analogue Multimeter. 3. Drawing inference and writing the report
3	Implement rectifier circuits to observe the effect of filter	1.Assemble the circuit as per the circuit diagram 2. Using the CRO to observe the waveforms 3. Assess the Power supply performance in terms of ripple and % Regulation 4. Drawing inference and writing the report

4	Plot the regulation characteristics of a power supply	1.Assemble the circuit as per the circuit diagram 2. Identify the 3 terminal Regulator and its package &pin Configuration 3. Find the output voltage and type from the IC Regulator number
5	Plot input and output characteristics of NPN transistors	1. Draw the symbols of NPN transistor. 2. Read the circuit Diagram 3. Identify transistor terminals 4. Identify the meters and equipment 5.Interpret NPN transistor datasheets and find the specifications
6	Obtain the input and output characteristics of JFET	1. Draw the symbols of FET, 2. Read the circuit Diagram 3. Identify the FET terminals 4. Identify the meters and equipment 5.Interpret JFET datasheets and finding the specifications.
7.	Amplifiers and oscillators	1.Read the circuit diagram for Amplifiers 2. RC coupled amplifier 3.RC Phase shift oscillator 4. Hartley/Colpitts oscillator

REFERENCES

Principles of Electronics by V.K. Mehta, S Chand& Co.

Basic Electronics and Linear circuits by Bhargava, TMH Publishers

Electronic Principle by Malvino

Electronic devices and circuits by Mathur, Chada&Kulashrestha

Industrial Electronics by G.K. Mithal

Applied Electronics by G.K. Mithal

ENGINEERING MATHEMATICS – IV
(Common to all Branches)

Subject Title : Engineering Mathematics-IV
Subject Code : EE - 401
Periods per week : 04
Periods per 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	05	09	1	2	0	0	0	0
	Unit – II								
2	Non-homogenous Linear Differential equations with constant coefficients	15	26	1	1	0	1	1	0
	Unit – III								
3	Laplace Transforms	25	49	2	1	0	2	1	1
	Unit – IV								
4	Fourier Series	15	26	1	1	0	1/2	1/2	1
	Total	60	110	5	5	0	3 1/2	2 1/2	2
			Marks	15	15	0	35	25	20

R: Remembering type 50 marks
U: Understanding type 40 marks
App: Application type 20 marks

OBJECTIVES

Upon completion of the course 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.

Unit-II

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-III

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-IV

4.0 Understand the 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 $(-\pi,\ \pi)$.

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, cosax, 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 $(0,\ 2\pi)$.

Reference Books

Higher Engineering Mathematics, B.V.Ramana, Tata McGraw-Hill

A.C MACHINES – I

Subject Title : A.C. MACHINES - I
Subject code : EE-402
Periods/Week : 05
Periods/semester : 75

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Number Of Short Answer Questions	Number Of Essay Answer Questions
1.	Study of single phase Transformers	**35**	**52**	**04**	**04**
2.	Study of Three phase Transformers	**10**	**16**	**02**	**01**
3.	Study of Alternators	**20**	**29**	**03**	**02**
4.	Parallel Operation of Alternators	**10**	**13**	**01**	**01**
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

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

1.0 **Understand the working of single phase transformer**
1.1 Define the word `Transformer'.
1.2 Explain the working principle of single-phase transformer.
1.3 What happens if 'DC Supply' is given to transformer
1.4 Classify the transformers based on
1) Number of phases 2) Construction 3) Function
1.5 Explain the constructional details of transformers.
1.6 State the purpose and function of each part of the transformer with legible sketch.
1.7 Explain about core type and shell type transformer.
1.8 Distinguish between core type and shell type transformers.
1.9 Derive the E.M.F equation of a single power transformer.
1.10 Define different ratio's in transformer
1) Turns Ratio 2) Voltage Transformer Ratio 3) Current Transformation Ratio.
1.11 Solve problems on EMF equation.
1.12 Explain working of transformer at No-Load and draw its vector diagram.
1.13 Explain working of transformer at Load and draw vector diagrams for
(1) Unity power factor
(2) Lagging power factor
(3) Leading power factor

1.14 List the losses taking place in a transformer.
1.15 State the effects of resistance and leakage reactance of primary and secondary windings.
1.16 Draw the equivalent circuit of a transformer by approximation.

1.17 Explain the procedure to find equivalent circuit parameters from No-load and Short circuit test of a transformer.
1.18 Define Regulation and derive the approximate equation of regulation for transformer.
1.19 Calculate regulation of a single phase transformer for
(1) Unity power factor
(2) Lagging power factor
(3) Leading power factor
1.20 State reason for transformer rating in KVA.
1.21 Derive efficiency and find the condition for maximum efficiency.
1.22 Solve simple numerical problems.
1.23 Define and calculate the all day efficiency for given load cycle.
1.24 Differentiate between distribution transformer and power transformer.
1.25 Explain the polarity test on single-phase transformer.
1.26 State the need for parallel operation of transformer.
1.27 Mention the conditions for paralleling and load sharing of transformers.

2.0 Understand Three Phase Transformers

2.1 State the advantages of 3 phase transformer over single phase transformer.
2.2 Draw a legible sketch of a power transformer.
2.3 Explain the function of each part of a power transformer.
2.4 List the different types of three phase transformer by giving their symbolic representation and voltage relationships
2.5 State the applications of
1) star-star 2) delta-star 3) star-delta and 4) delta-delta connected transformer.
2.6 State the conditions for parallel operation of 3 phase transformer.
2.7 List the special transformers.
2.8 State the advantages and disadvantages of autotransformers (and it's applications).
2.9 State the expression for saving of copper in auto transformer.
2.10 State the necessity of cooling of power transformers.
2.11 Explain the methods of cooling of power transformer.
2.12 Explain the `on load' and `off load' tap changing.
2.13 Explain the procedure for tap changing for on load and no load tap changer.

3.0 Understand the classification, construction, working and testing of alternators

3.1 Explain the Principle of working of Alternators.
3.2 Describe the constructional details of Alternators with legible sketch.
3.3 Classify the alternators based on rotor construction and explain them.
3.4 Explain the working of the alternator having
1) Cylindrical Rotor
2) Salient Pole Rotor.
3.5 State the advantage of Stationary Armature.
3.6 List the main parts of alternator along with materials used.
3.7 State the effect of Chording and Distribution factor and derive expressions.
3.8 Derive EMF equation of an alternator taking into account distribution factor and pitch factor.
3.9 Solve simple problems on E.M.F equation
3.10 State the need for an exciter in an Alternator.
3.11 List the various types of exciters (main, pilot and static)
3.12 Explain Armature Reaction of Alternator at different P.F's.
3.13 State the reasons for voltage variations on Load.
3.14 Define the term synchronous impedance.
3.15 State the effects of synchronous impedance on the operation of the Alternator.
3.16 Draw the equivalent circuit representing armature resistance, leakage reactance and armature

Reaction reactance.

3.17 Obtain the relation between No load EMF and terminal voltage in Alternator.

3.18 Draw the vector diagram for No load EMF in alternator at different power factors.

3.19 Define regulation of an alternator.

3.20 List the different methods of finding the regulation of alternator.

3.21 Calculate the regulation by synchronous impedance method.

3.22 Solve problems on Synchronous impedance method.

4.0 Comprehend the procedure for parallel operation, voltage control and synchronisation of alternator.

4.1 Explain the necessity for parallel operation of alternators

4.2 State the conditions for synchronisation

4.3 Explain the procedure of synchronisation by using lamp methods.

4.4 Explain the method for adjusting the loads shared by two alternators (or one alternator with Infinite bus bar).

4.5 Explain Effect of change in input and excitation of an alternator connected to Infinite bus.

4.6 Solve problems on load sharing.

COURSE CONTENT

1. Transformers

Classifications of transformers, Construction of transformers, Theory of an ideal transformer - emf equation derivation - Ratio of transformation and relation between turn ratio - Voltage ratio and current ratio, Transformer on no load - No load current components and no load power factor -Transformer on load - Equivalent circuit of transformer - Equivalent circuit constants by transformation, Short circuits test - Regulation of transformer - definition and derivation of approximate equation for regulation based on vector diagram for lagging ,leading, unity power factor - determination of regulation from S.C. Test data , Losses in transformer -determination from O.C. and S.C. tests data- efficiency, condition for maximum efficiency – rating of transformer-All day efficiency definition - Calculation for a given load cycle- problems, Polarity test - Efficiency calculation, Parallel operation of single phase transformers - necessity - conditions for paralleling-load sharing of single phase transformers

2. Three phase transformer

Descriptive treatment of star-star, delta-delta, star-delta and delta-star, voltage current and phase relation for the above groups-conditions to be fulfilled for paralleling 3 phase transformer, open delta working of 3 phase transformers, Auto-transformers –expression for copper saving – applications, Necessity of cooling - Methods of cooling - Sketch of power transformer indicating parts and explain their functions - Tap changing gear - no load and on load tap changing procedure.

3. Alternators

Classification of low, medium and high speed alternators - Brief description of parts with sketches and function of each part, construction, Assembly - Exciter and pilot exciter – Stationary armature type construction – Advantages**,** Concentrated and distributed windings - short pitch and full pitch coils - Effect of chording and distribution factors - EMF equation - Derivation – Problems**,** Cause for variation of voltage on load - Resistance, leakage reactance - Armature reaction - Synchronous reactance and synchronous impedance concepts - phasor diagram for unity, lagging and leading power factor loads, Regulation - definition - derivation of

relation between no load voltage and on load voltage for different power factors – Different methods of finding regulation- Calculation of regulation by synchronous impedance method.

4. Parallel operation of alternators

Necessity for parallel Operation - condition to be fulfilled for synchronisation, Synchronisation by lamp methods - Load sharing – simple problems-Effect of change in excitation and input of an alternator connected to infinite.

REFERENCES:

1. Electrical Technology - Vol –II by B.L. Theraja
2. Electrical Technology - Uday A.Bakshi and Mrs.Varsha.U.Bakshi
3. AC machines by M.G Say
4. Electrical machines by P.S. Bhimbra, Khanna Publishers
5. Electrical machinery- A.E. Fritzgerald, C. Kingsley and S. Umans, Mc Graw Hill
6. Electric machines – MV Deshpande, Wheeler publishing.
7. Fundamentals of Electric machines - BR Gupta and Vandana singhal

POWER SYSTEMS - II

(Transmission & Distribution)

Subject Title	**:**	**POWER SYSTEMS - II**
Subject Code	**:**	**EE- 403**
periods / week	**:**	**05**
Periods / Semester	**:**	**75**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of marks	Short questions	Essay questions
1.	Transmission lines	**30**	**34**	**3**	**2 & 1/2**
2.	HVDC transmission	**04**	**3**	**1**	
3.	Line structures for transmission and Distribution	**23**	**26**	**2**	**2**
4.	Cables	**5**	**13**	**1**	**1**
5.	Substations	**5**	**13**	**1**	**1**
6.	Distribution	**8**	**21**	**2**	**1&1/2**
	Total	**75**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Comprehend the need for transmission and choice of supply systems

1.1 State the need of transmission lines and distribution lines
1.2 Explain the transmission supply systems

i) D.C ii) A.C

1.3 State the advantages of D.C and A.C. transmission systems..
1.4 State the supply systems based on the conductor material required for overhead lines and underground cables

AC - 1 ph 2 wire system
AC - 3 ph 3 wire system
DC - 2 wire system

1.5 Explain the effects of the following on Transmission lines.

i) Supply frequency ii)Supply voltage

1.6 Explain the effect of voltage on

i)Line efficiency ii)Voltage drop

iii)Line loss iv)Active & reactive Power

v)Volume of conductor material

vi)Cost of-transformers, insulators, switchgear, supports etc.

1.7 State the empirical formula for determining the system voltage

1.8 State the type of transmission line conductors

a) Solid b) Stranded c) Hollow

d) Bundled conductors

1.9 State the relative merits of different types of above conductors

1.10 Explain the current distortion effects

i) Skin effect ii) Proximity effect

iii) Spirality effect iv) Kelvin's law

1.11 State the different types of conductors used in transmission lines

1.12 Derive expression for inductance of 1 phase system

1.13 Give the expression for the inductance of 3 phase symmetrical and asymmetrically spaced round conductors (No derivation)

1.14 State the need for transposition of overhead lines

1.15 Explain the effects of transposition of overhead lines

1.16 Compute inductance in transposed lines

1.17 Define capacitance

1.18 Derive the expressions for capacitance of1 phase system

1.19 Give the expressions for capacitance of3 phase symmetrically spaced, asymmetrically spaced and transposed lines round conductors (No Derivation)

1.20 Use the conductors tables for determining the inductance and capacitance of overhead lines of different voltage

1.21 Define short, medium and long lines.

1.22 State the reasons for the constants lumped in short lines and medium transmission lines.

1.23 Define `regulation' and percentage regulation.

1.24 Derive the approximate formula for percentage regulation.

1.25 Compute the following for short transmission line:

Sending end voltage

Sending end P.F

percentage regulation

Efficiency for the given receiving end condition

1.26 Solve problems on short lines

1.27 Compute the percentage regulation, efficiency of medium transmission lines with given receiving end conditions and line parameters using:

Nominal (pie) method

Nominal T- method

1.28 Draw the phasor diagram in the above methods

1.29 Solve problems in medium transmission lines

1.30 Explain the charging current in lines and power loss due to it

1.31State `Ferranti' effect.

1.32 Compute the rise in voltage at the receiving end
1.33 State the factors affecting corona
1.34 Explain corona in transmission lines
1.35 State the disruptive critical voltage and give its formula
1.36 State the empirical formula for power loss due to corona
1.37 State the effect of corona
1.38 Explain the methods of reducing corona
1.39 Explain the concept and applications of hot line technique.

2.0 Appreciate HVDC transmission

2.1 Discuss basic concepts of HVDC transmission
2.2 List the types of HVDC.
2.3 Know the location of Projects in India.
2.4 Discuss the advantages and disadvantages of HVDC transmission.
2.5 Discuss the protective measures to be adopted for HVDC system.

3.0 Comprehend Line structures for transmission and Distribution

3.1 State the main components of overhead lines
3.2 State the requirements of line supports
3.3 List the factors influencing the selection of the line supports
3.4 List the types of line supports
3.5 State the advantages and disadvantages of the above line supports
3.6 State the need for cross arms
3.7 Give the formula for economical spacing of conductors
3.8 State the necessity for pole guys
3.9 Describe the methods of fixing of guys
i) Bow ii) Fly guys iii) Strut pole
3.10 State the factors on which the conductor spacing and ground clearance depend
3.11 List the common conductor spacing and ground clearances adopted for
i) 66 KV ii) 33 KV iii) II KV iv) L.T. lines
3.12 List the Maximum earth resistance value together with the size of pipe or plate used for Earthing.
3.13 State the minimum ground clearances adopted for
i) 66 KV ii)132 KV iii) 220 KV
3.14 Explain a method of laying foundation to towers
3.15 Define `sag'
3.16 State the factors affecting the sag
3.17 Derive an equation for the approximate method of calculating sag.
i) when the supports are at the same level
(a) in still air and (b) with the effect of wind and ice
ii) when the supports are at different levels
3.18 Solve the problems on above
3.19 State the disadvantages of loose spans(sag more than prescribed value)
3.20 State the purpose of insulators in transmission and distribution lines
3.21State the requirements of insulators
3.22 State applications of the following insulators.

i) Pin type ii) Strain type iii) Suspension type
iv) Shackle type

3.23 Tabulate the relative merits of pin type insulator over suspension type insulators

3.24 Show that the voltage across a string does not distribute uniformly across the individuals discs

3.25 Define the terms i)Flashover ii)Puncture iii)String-efficiency

3.26 Solve problems on distribution of voltage across string

3.27 State the methods of improving string efficiency

i) By eliminating ground capacitance
ii) By grading of the units
iii) Static shielding(guard ring)

3.28 Solve problems on equalisation of potential across a string

3.29 List causes of failure of insulators in transmission and distribution lines

3.30 State the need for arcing horns and guard rings

3.30 List causes of failure of insulators in transmission and distribution lines.

4.0 Comprehend Underground Cables

4.1 Define cables

4.2 Compare overhead lines with underground cables

4.3 State the classification of cables based on:

Number of conductors
Voltage
Insulation and lead sheathing
The methods of improving the dielectric stress

4.5 Describe the construction of different types of cables

i) Low voltage cables ii) H.T cables
ii) Super tension cables iv) EHV cables

4.6 Derive an equation for the insulation resistance of a cable

4.7 Solve problems on insulation resistance

5.0 Comprehend substations

5.1 Explain the need for substations

5.2 State the relative merits of indoor substation ,outdoor substation and Gas insulated Substations over others.

5.3 List the equipment used in substation.

i) Bus bars ii) Insulators iii) Transformers
iiv) Switchgear v) Indicating and Metering equipment
vi) Protective relays vii) Lightning arrestors
viii) Cables ix) Fire fighting equipment

5.4 State the purpose of each of the above equipmen

5.5 Explain Substation auxiliary supply.

6.0 Understand the Different Distribution Systems

6.1 Distinguish between primary distribution and secondary distribution

6.2 Explain Feeder, distributors and service mains

6.3 Classify the type of distribution systems according to

i) Type of current ii) Construction

iii) Service iv) Number of wire

v) Scheme of connections

6.4 List the type of distribution systems

i) Radial and ii) Ring main systems

6.5 State the advantages and disadvantages of the following systems

i) radial and ii) ring main systems

6.6 List the steps involved in the voltage drop calculations in A.C. distributors

6.7 Solve problems on voltage drop calculations in D.C & A.C. Distributors.

COURSE CONTENTS:

1. Transmission Lines: Need for transmission lines-Transmission supply systems, Relative advantages of AC & DC Transmission, Choice of frequency, Choice of voltage, Effect of voltage, Empirical formula for determining the system voltage, H.V.D.C. power Transmission, Operational techniques of H.V.D.C, Requirements of conductor material -Types of conductor-Solid-Stranded-Hollow- Bundled conductors - Relative merits of different types of conductors-Kelvin law –Transmission parameters: Resistance, Inductance capacitance-skin effect, proximity effect, spirality effect-Determination of resistance of solid, ACSR and of Round and Parallel Conductors ,Transposition of O.H. lines-Effect of AAAC conductors using conductor tables-Determination of inductance transposition on Inductance calculations in transposed lines, Calculation of capacitance in round and parallel conductors -Use of conductor tables of determination of inductance and capacitance of transmission lines-

Regulation and % Regulation-Approximate formula for Regulation-Short line calculation of-Efficiency-Regulation-Sending end voltage-sending end p.f. for the given receiving end conditions -Regulation-Sending end voltage-sending end p.f. for the given receiving end conditions in medium transmission lines using Nominal pie method-Nominal T method –Vector diagrams in the above methods-Charging current in lines-Ferranti's effect-Corona in transmission lines-Power loss due to corona-Effects of corona-Methods of reducing corona - Hot line technique - concept and application

2. High voltage DC Transmission: Basic Concepts and Types of HVDC transmission- HVDC projects in India - Advantages and disadvantages of HVDC transmission. Basics of protection of HVDC systems.

3. Line structure for Transmission and Distribution: Requirements of line supports, Factors influencing the selection of line support-Types of lines supports-Foundation for poles Descriptive treatment- Cross arms for L.T and H.T lines up to 33 KV- Pole guys- Conductors spacing and ground resistance-Types of poles, Types of towers used for 66 KV,132 KV,220 KV and 400kv,Layouts of poles and towers, lines spaces-Approximate ground clearance-Foundation to towers Earthing of towers Sag, Factors affecting sag, calculating sag.

Disadvantages of loose span, stringing charts, Insulators, Requirements of insulators , Materials used , Types of Insulators, Voltage distribution across string of suspension Insulators, string efficiency, Flashover, Puncture, string efficiency, improving string efficiency, eliminating the ground capacitance, grading, static shielding , Arcing horns and guard rings, Causes for failure of insulators.

4. Cables: Comparison between O.H. Lines and underground cables, Classification of cables, General construction of cables,Types of cables, Insulation resistance of cables, Specifications of cables.

5. Sub-stations: Definition and classification of sub-stations, Relative merits of indoor and outdoor sub-stations equipment in sub-stations Bus-bars, Insulators, Switch gear, Transformer, Protective relays, Meters, Lightning arrestors, Cables, Fire fighting equipment, Bus bar arrangements - Typical sketches Typical layouts and sketches of 33/11KV SS, 66/11 KV, 132/11 KV, Earthing adopted in 132/11KV, 66/11 KV, 33/11 KV and pole mounted and plinth mounted SS, Substation Earthing.

6. Distribution: Primary and secondary distribution, Feeders, distribution and service mains, Classification of Distribution systems, Radial and Ring system of Distribution, D.C & A.C. Distribution(single phase), Steps in voltage drop calculation.

Reference Books:

1. V.K. Mehta -Principle of Power systems
2. S.L. Uppal - Electrical power
3. Sony, Gupta & Bhatnagar -Text book of Elect. Power
4. JB Gupta -Electrical Power
5. CL Wadhwa -Electrical power Systems - New Age International(P) limited.
6. KR Padiyar - HVDC Power Transmission system Technology
7. S.N. Singh -Electrical Power generation, transmission and distribution, PHI,2003

ELECTRICAL INSTALLATION AND ESTIMATION

Subject Title : **ELECTRICAL INSTALLATION AND ESTIMATION**

Subject code : **EE- 404**

Periods/Week : **04**

Periods/Semester : **60**

TIME SCHEDULE

Sl.No	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Question
1.	Wiring Systems	08	11	02	1/2
2.	Estimation of Lighting and Power Loads	20	36	02	03
3.	Estimation of OH Lines and Earthing	14	36	02	03
4.	Departmental Test, REC and Electrical Act 2003	10	16	02	01
5.	Maintenance of transformers & Safety	08	11	02	1/2
	Total	**60**	**110**	**10**	**08**

OBJECTIVES:

Upon completion of the course the student shall be able to

1.0 Mention the use of wires and cables, Types of Installations and wiring Accessories.

1.1 Compare VIR, CTS, PVC, Lead Sheathed, Weather proof aluminium and copper wires.

1.2 Mention the uses of cables LV,HV, EHV and oil filled H types, SL, HSL and types of 3-phase cables

1.3 State the uses of standard wire gauge.

1.4 Specify the gauge of wire and number of strands in a multi strand by giving its current carrying capacity

1.5 Explain (i) C.T.S system (ii) T.R.S. system, (iii) Surface conduit system (iv) Concealed wiring system.

1.6 List the Main Switches as:

i) Double pole iron clad (DPIC)

ii) Triple pole iron clad (TPIC)

iii) Triple pole iron clad with neutral link (TPICN)

iv) Distribution use board Ironclad

v) MCB types with specifications, MCCB, ELCB and RCCB and specify their applications.

1.7 List the different types of fuses as i) Rewirable fuses ii) Open type fuses iii) Kit kat type fuses iv) Cartridge fuses and specify the fuse carrier material used, ratings and their usage.

2.0 Estimate Lighting and Power loads

2.1 Explain different types of service mains

2.2 Select the service main suited to the given situation

2.3 State the merits and demerits of different systems of interior wiring.

2.4 Select the type of wiring system suitable to the given situation

2.5 List the electrical material used in wiring the service mains.

2.6 List the schedule of rates used in preparing estimate

2.7 Estimate the material requirement for indoor wiring given the plan of a building.

2.8 Draw the wiring layout for a big office building

2.9 Draw the wiring layout for a workshop/ Electrical Laboratory

2.10 Draw the wiring layout of a Big industry.

2.11 Draw wiring layout of a Big Hotel with lift arrangement

2.12 Draw the wiring layout and estimate the material required for a Residential Building with 2 bed room house.

2.13 Prepare layout and draw single line wiring diagrams as per standard practise for a given set of machines in a workshop.

2.14 Select type of wiring system and lighting requirements

2.15 Calculate the wire sizes for various circuits

2.16 Specify important materials used under given condition

2.17 Calculate the quantities of all materials required for the above.

2.18 Prepare the estimate of the complete installation as per standard practice

2.19 Select the type of wiring and service mains used for the irrigation pump set

2.20 Specify the material used in the execution of the irrigation pump set installation.

2.21 Prepare an estimate for electrifying the irrigation pump set scheme

2.22 Prepare estimation for submersible pump installation

3.0 Estimate the type of material and quantity required for OH Lines and Earthing

3.1 Calculate the total number of insulators required for the given scheme

3.2 Select the type of insulators to be used for over head lines.

3.3 Select the type size and number of cross arms required for the overhead line

3.4 Determine the size and total length of overhead conductor required for the line giving due consideration for the sag to be allowed

3.5 Estimate the quantity of all materials required for given 11 KV and 400 v overhead lines as per standard practice followed by NEC

3.6 Estimate the quantity of material required for the following transformer substations

i) pole mounted ii) plinth mounted

3.7 Select supporting poles of suitable size and height to install a given transformer as per standard practice in NEC

3.8 Draw plinth and Pole Mounted transformer substation and estimate the quantity of materials required in each case.

3.9 Estimate the quantity of all the electrical accessories and componentsrequired for the given i) Pole mounted transformer i) Plinth mounted transformer including the operating mechanism as per standard practice in NEC

3.10 State the purpose of Earthing and types that are normally used.

3.11 Select the suitable type of Earthing for a given installation as per IS3043.

3.12 Specify the different components used in electrical Earthing of a given installation

3.13 List the materials that are to be used in the earth pit surrounding the earth electrode

3.14 Prepare the estimate for pipe and plate Earthing

4.0 Departmental Test, REC and Electrical Act 2003

4.1 Describe the departmental procedure for obtaining a service connection.

4.2 Specify insulation resistance desirable for a given electrical installation.

4.3 Specify the value of earth resistance to be maintained for a given electrical installations.

4.4 Describe the test procedure for continuity of wiring in an electrical installation.

4.5 Explain the procedure for conducting insulation test of domestic wiring.

4.6 Survey the load particulars in a village for

i) Domestic ii) industrial iii) agricultural loads.

4.7 Calculate the capacity of a transformer required assuming suitable diversity factor

4.8 Determine the location point of transformer and calculate the tail end voltage regulations as per the practice in NEC.

4.9 Determine the economic feasibility of the scheme as per the standard norms fixed by REC to execute the scheme.

4.10 State major rules applicable to electrical installations as per Electrical act 2003

4.11 Write as per the Electrical act 2003, the rules and procedures to be adopted during execution of the following electrical installations.

i) Domestic lighting & Power ii) Industrial

4.12 State the standards and code of practice followed by NEC in respect of electrical installations and OH lines of 11 KV and 400V pole mounted and Plinth mounted transformers.

4.13 State new I.E. Rules relating to safety and electric supply given by the Central Electricity Authority- 2010.

5.0 Comprehend the Maintenance of Transformer & Understand the Safety Procedure

5.1 Preventive and periodical maintenance schedule of the

(i) Power transformers

(ii) Pole mounted transformer yard

(iii) Plinth mounted transformer yard

5.2 State the need of safety

5.3 List the Equipment used for Electrical and general safety purpose

5.4 Describe the different types of Electrical hazards / accidents

5.5 Describe the causes of different Electrical hazards / accidents

5.6 Describe the methods to avoid Electrical hazards / accidents

5.7 Describe the First-Aid methods followed to rescue a person met with Electric shock.

5.8 Discuss the reasons for not using fuse in Neutral wire.

5.9 List the Do's & Dont's of Electrical supervisor at substations.

COURSE CONTENTS:

1. Wiring Systems and Safety Procedures

Introduction, size of wires, standard wires, types of wires, CTC, PVC, Lead sheathed .VIR, weather proof wires, flexible wires different types of cable wires - Types and Installation of House Wiring Systems & Wirings Accessories : Methods of installing wiring, clips, screws - round blocks switch boards, sockets socket pins - CTS wiring - Installation of surface conduit wiring - Rigid conduits, flexible conduits - Conduit accessories - elbows bushings - reducers, conduit box saddles, PVC conduit wiring - Concealed wiring - Comparison of various wiring systems – Distribution fuse boards - Main switches - Different types of fuses and fuse carriers.

2. Estimation of Lighting and power loads

Estimation of domestic lighting installation service main - types of wire - specification - quantity of materials required for service main – estimation and selection of interior wiring system suitable to a given building - number of circuits - calculation of length of wire and quantity of accessories required - estimates of materials for execution of the domestic wiring installation as per National Electrical act 2003 .Power wiring installation Drawing wiring layout for a big office building, electrical laboratory, big industry, big hotel with lift arrangement and a residential building with 2 bed room house.- estimation and costing upto 20 kVA calculation of load current based on ratings of various equipment's to be installed - size of wire - length of wire number of circuits - quantity of accessories for execution of work as per standard practice. Irrigation pump installation - Estimation upto 10 HP service main - type-calculation of size and quantity of wire and other components required - Labour cost for erection - Type of starter and control panel - accessories quantity and estimation Estimate for the installation of submersible pump.

3. Estimation of OH Lines and Earthing

Distribution lines of 11 kV and 400Volt OH lines - estimation only -quantity of materials required for lines of length 1 km - number of poles - Cross arms clamps - insulators - conductor length and size for a given power transmission Distribution transformer erection- Estimation of quantity of materials required for structures, isolators - HG fuse operating mechanism, isolators, lightening arrestors for pole mounted substation and plinth mounted substation, Quantity estimation for materials required in electrical Earthing both for pipe earthing and plate Earthing suitable to 89 the given equipment or transformer substation.

4. Departmental Tests and REC and Electrical Act 2003

Electrical installation testing - departmental procedure for testing before giving service connection - departmental procedure for obtaining service connection - desirable insulation resistance for domestic and power circuits - Tests for measuring insulation resistance - procedure for conducting insulation resistance test and continuity tests, earth continuity test Design of rural electrification scheme - Load survey-determination of capacity of transformer - estimation of quantity of materials required for the erection of distribution lines and 11 kV feeder from a nearby 11 kV feeder - determining the economic feasibility of the scheme as per the procedure laid out in NEC, - Extracts from Indian Electricity rules 1956 and code of practice by NEC regarding - domestic power, agricultural industrial wiring installations, erection of 11 kV, 400 Volt distribution lines - pole mounted transformer - New I.E. Rules.

5. Maintenance of Transformers and Safety

Preventive and periodical maintenance schedule of the power transformers,

Pole mounted transformer yard and Plinth mounted transformer yard, introduction to safety

Need of safety - Equipment used in Electrical and general safety – Different types of Electrical hazards / accidents - Causes of different Electrical hazards / accidents - Methods to avoid Electrical hazards / accidents - First-Aid methods followed to rescue a person met with Electric shock - Do's & Don’ts of Electrical supervisor at Electrical substations.

DIGITALELECTRONICSANDMICROCONTROLLERS

SubjectTitle : DigitalElectronicsandMicroControllers

SubjectCode : EE-405

Periods/We : 05

Periods/Semester : 75

TIMESCHEDULE

Sl.	Majortopics	No.of	Weightage	Short	Essay
1	BasicsofDigitalElectronics	20	26	2	2
2	Flip-flops,Registers, CountersandMemories	15	26	2	2
3	Architectureof8051	15	26	2	2
4	Instructionsetof8051	15	19	3	1
5	Programmingconcepts	10	13	1	1
Total		**75**	**110**	**10**	**8**

OBJECTIVES

Oncompletionofthestudyofthesubjectthestudentshouldbeableto comprehendthefollowing

1.0 Know the basicsof Digital Electronics

1.1 ExplainBinary number system

1.2 Performbinaryaddition,subtraction,MultiplicationandDivision.

Write1'scomplementand2'scomplementnumbersforagivenbinary number.

1.3 Performsubtractionofbinarynumbersin2'scomplementmethod.

Explain Octal,Hexadecimalnumbersystems.

1.4 Explain BCD number system and perform additions and subtractions

1.5 Convertonenumbersystemtoother number systems

1.6 Mention ASCIICode.

1.7 ExplaintheimportanceofparityBit.

1.8 StatedifferentpostulatesinBooleanalgebra.

1.9 ExplainAND,OR,NOTGateswithtruthtables.

1.10 StateDe-Morgan'stheorems.

1.11 ExplaintheworkingofNAND,NORgatesusingtruthtables.

1.12 ExplaintheworkingofanExclusive–ORgatewith truth table.

1.13 Explain the function of Half –adder and Full adder

1.14 ShowthattwoHalf-addersandOR–gateconstituteafull-adder.

1.15 Explaintheworkingof 4Bitparalleladderusingfull-adders.

1.16 Drawandexplaintheoperationof2X4decoder.

1.17 Drawandexplaintheoperationof4X2encoder.

1.18 State the need for a tri-state buffer.

1.19 Explain 8X1 multiplexer

1.20 Explain 4 bit comparator

2.0 UnderstandtheworkingofFlip-flops,Registers,CountersandMemories

2.1 ListdifferenttypesofFlip-flops

2.2 Explaintheworkingof RSandRSTflipflopswithtruthtables

2.3 ExplainJKflipflop&J-KMaster-SlaveFlip-flopwiththe truthtables

2.4 Mention theneedforpresetandclearinputs

2.5 ExplaintheDflip-flop,Tflip-flopwiththehelpoftruthtables

2.6 ListthedifferenttypesofRegisters

2.7 Explaintheworking ofSerialinSerialout,SerialinParallelout,Parallelin SerialoutandParallelinParallel outwithLeftshiftandRightshiftoperation ofshiftregister withablockdiagram.

2.8 State the function of a counter

2.9 Differentiatebetweensynchronousandasynchronouscounters.

2.10 Explaintheworkingprincipleofasynchronous4-bitripplecounterwith thehelptruthtableandwaveforms.

2.11 Explaintheworkingprincipleof4-bitdecadecounterwiththehelptrutht ableandwaveforms

2.12 Classifythedifferenttypesofmemories

2.13 Differentiate between RAM and ROM

2.14 DifferentiatebetweenFlashROMandNVRAM

3.0 ComprehendtheArchitectureofMicrocontroller8051

3.1 List thefeaturesof 8051 microcontrollers.

3.2 Drawtheblockdiagramofamicrocomputerandexplainthefunctionof eachblock.

3.3 Givethepindiagramof8051microcontrollerandspecifythepurpose ofeachpin.

3.4 Givethefunctionalblockdiagramof8051microcontroller

3.5 Explain theregisterstructureof8051.

3.6 Explainthefunctionofvariousspecialfunctionregisters.

3.7 Describeinternalmemory,externalmemoryandportsof8051.

3.8 Explaintimers&counters i n 8051

3.9 Explainserialinput/outputportsof8051

3.10 Explain the use of Interrupts in 8051

3.11 Explaininterruptcontrolsin8051.

4.0 KnowtheInstructionsetof8051Microcontroller

4.1 Statetheneedforaninstructionset.

4.2 Givetheinstructionformatof8051.

4.3 Explainfetchcycle,executioncycleandinstructioncycle.

4.4 Distinguishbetweenmachinelanguage,assemblylanguage,andHigh levellanguage

4.5 Classifyinstructionsetof8051basedonfunctionandlength.

4.6 Explainthetermsoperationcode,operandofaninstruction.

4.7 Knowthevariousaddressingmodesof8051.

4.8 Explaindatatransferinstructionsof8051.

4.9 Explainthearithmeticinstructionsandrecognizetheflagsthatareset orresetforgivendataconditions.

4.10 Explainthelogicinstructionsandrecognizetheflagsthataresetor resetforgivendataconditions.

4.11 ExplainunconditionalandconditionalBranchingoperations

Explain the use of flagstochangethesequenceofprogram.

4.12 Mention the various logical operations in 8051

explaintheiruseinmaking,setting andresettingofindividualbits.

5.0 Programming concepts

5.1 Knowthevarioussymbolsusedindrawingflowcharts.

5.3 Writeprogramsinmnemonicsusing data transfer, arithmetic and logical instructions

5.4 Write programstoperformsinglebyteandmultibyteaddition.

5.5 WriteaProgramtosumupgivenNnumbers

5.6 WriteaProgramtosumoffirstNnaturalnumbers

5.7 WriteaProgramtomultiplytwo8-bitnumbersusingMULinstruction

5.8 WriteaProgramtofindbiggestdatavalueingivendataarray

5.9 WriteaProgramtoconvertagivenHexnumbertoBCDnumber

COURSECONTENTS

1. BasicsofDigitalElectronics

Binary,Octal.Hexadecimalnumberingsystems.Conversionfromone systemtoanothernumbersystem.Binaryarithmetic's–1'sand2'scomplements.

Logicgates:AND,OR,NOT,NAND,NOR,Exclusive-OR. Booleanalgebra.Demorgan'sTheorems. Implementationofarithmetic circuits, Half adder, Full adder, parallel Binary adder. Parallel adder, decoder, encoder, tri-state buffer

2. Flip-flops,Counters,RegistersandMemories

Principleofflip-flopoperation,RS,RST,JK,JKMasterSlave,T,Dflip-flops.Preset andclearinputs.ShiftRegisters-SerialinSerial out,SerialinParallelout,ParallelinSerialoutandparallelinParallel outwithLeftshiftandRight-Binarycounters-4-bitripplecounter, decadecounter. Memories,RAMandROM,dynamicmemory,Flash ROMandNVRAM.

3. Architecture of Microcontroller 8051

Blockdiagramofmicrocomputer,Blockdiagramof8051,Pinout diagramof8051,registerstructure,specialfunctionregistersinternalmemory,externalmemory,timer-counter,serialinput/outputports, interrupts,

4. Instructionsetof8051

Instructionsetof8051,instructionformat,machinelanguage,assemblylanguage,classificationofinstructions,addressing modes–opcode,operandGroupsofinstructions,datatransfer instructionsarithmeticinstructions,logicinstructions,branchingoperations,Booleangroupofinstructions.

5. Programmingconcepts:

Flowcharts,Datatransfer,singleandmultibyteaddition,sumup givenNnumbers,multiplytwo8-bitnumbers,biggestdatavalueinadataarray,HexnumbertoBCDnumber.

Reference Books

1. DigitalElectronicsandlogicdesign by B.SomanathanNair, PHI
2. DigitalComputerElectronics by Malvino&Leach.,TMH
3. 8051Microcontroller by MazidiandMazidi.
4. 8051 Micro controller by Kenneth J.Ayala.
5. Programmingcustomizingthe8051Microcontroller by MykePredkoTMH
6. ModernDigitalElectronics By RPJAIN TMH
7. DigitalElectronics TokhemTMH
8. DigitalElectronics PuriTMH
9. DigitalComputerFundamentals by Barty

GENERAL MECHANICAL ENGG.

Subject title : General Mechanical Engineering.

Subject Code : EE-406

Periods/Week : 04

Periods/Semester : 60

TIME SCHEDULE

S.No	Major Topics	Number Of Periods	Weightage of Marks	Short questions	Essay questions
01	Simple Stresses & Strains	14	26	02	02
02	Torsion in Shafts	10	16	02	01
03	I.C Engines	12	26	02	02
04	Boilers, Turbines	12	26	02	02
05	Pumps, Lubricants	12	16	02	01
	Total	60	110	10	08

OBJECTIVES

On completion of the course the student should be able to comprehend the following

Understand the concept of stress and strain

Define the terms : stress and strain

Identify the different types of stresses and strains

Define Hooke's law

Define modulii of elasticity

Draw typical stress-strain curve for an M S Specimen under tension

Define factor of safety

Define Poisson's ratio

State the relationship between elastic constants.

Calculate the dimensional changes in the bodies of uniform cross section subjected to tensile and compressive forces

Appreciate the theory of torsion

State the function of shafts.

Specify the standard sizes

Write down simple torsion equation and explain the terms involved

Design the size of solid shaft

Strength point of view
stiffness point of view

Understand the working of I C Engines

Explain the constructional details of I.C. Engines

Define I.C. Engine

Identify the various parts of

Diesel engine

Petrol engine

Explain the principle of 4-stroke diesel and petrol engine

Explain the principle of 2-stroke diesel and petrol engine

Distinguish between 4-stroke cycle and 2-stroke cycles

Distinguish between diesel engine and petrol engine

State the functions of IC engine components - carburetor, fuel pumps and governor

Understand the working of Boilers and Steam Turbines

Explain the function of a boiler
Classification of boilers

Compare fire tube boiler with water tube boiler

Understand high pressure boilers

Explain Lamont boiler with a neat sketch

Identify the necessity of mountings such as

water level indicator

Pressure gauge

Stop valve

Feed check valve

safety valve

Fusible plug

Identify the accessories such as

Economizer

Super heater

Air pre heater

Mention the working principle of above with sketches.

Explain the principle of working of a steam turbine

Classify the turbine based on action of steam

Compare impulse turbine with reaction turbine

Study the De Level and Parson turbines

Understand the working of hydraulic turbines and centrifugal pumps.

Classify the water turbines

Illustrate the working principle of

Pelton wheel

Francis turbine

Kaplan turbine

Explain the principle of operation of centrifugal pump

Explain the constructional details of centrifugal pump.

State the purpose of lubrication

State the properties of a lubricant

List the types of lubricants with examples

Know the application of lubricants.

COURSE CONTENTS

1. Simple stress and strains

Definitions, Tensile stress, Compressive stress, Shear stress, Linear strain, lateral strain and, Poisson's ratio, elastic limit, statement of Hook's law, stress-strain diagram with salient features for ductile materials under tensile stress. Elastic modulii, Definition and explanation of Young's modulus, Modulus of rigidity, Bulk modulus, Working stress, Ultimate stress,Factor of safety. Simple problems on tensile and compressive stress

and strains in uniform and varying cross section bar (tapering sections omitted), Relationship between Young's modulus ,rigidity modulus and bulk modulus (without proof) problems thereon

2. Torsion in shafts

Function of shafts, standard shaft sizes, Polar moment of inertia of hallow and solid (no proof)shafts. Torsion equation, Design of shaft based on strength and rigidity.

3. Constructional details of I.C. Engines.

Four stroke and two stroke petrol and diesel engines. petrol engine for 4 stroke / 2 stroke, diesel engine for 4 stroke/ 2 stroke , Comparison between petrol and diesel engine, Functions of carburetor, fuel injection pump, governor

4. Working of boilers and steam turbines

Classification of boilers, fire tube-water tube boilers, high pressure boiler, Sketch and description of La Mont boiler, boiler mountings.

Boiler accessories (sketch, description and functions of) Economizer, Super heater, Feed water heater, Air pre-heater.

Working principle of steam turbine- Classification based on steam action-comparison between impulse and reaction turbines. Explanation of De Level and Parson Turbines.

5. Hydraulic turbines and Pumps

Classification of turbines- Pelton, Francis and Kaplan turbines. Centrifugal Pump, Single stage, lubricants - examples and their applications

REFERENCE BOOKS

1.	Strength of materials	by Ramamrutham
2.	Strength of materials	by Surender Singh
3.	Strength of materials	by S.B.Junarker
4.	General Mechanical Engineering	by Lakshminarayana
5.	General Mechanical Engineering	by GopalaKrishna
6.	Hydraulic Machinery	by Jagadishalal
7.	Strength of Materials	by R.S. Khurmi

ELECTRICAL ENGINEERING DRAWING

Subject Title : Electrical Engineering Drawing

Subject code : EE-407

Periods/week : 06

Periods/ Semester : 90

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of marks	Short Questions	Essay Questions
1	Graphical symbols, view of fuses, Couplings and bearings	9	10	02	---
2	D.C. Machines	21	15	---	01
3	Transformers	15	20	---	01
4	Induction Motors	18	20	---	01
5	D.C and A.C. windings	18	10	---	01
6	Supporting structures & Earthing Systems	9	05	02	---
	Total	**90**	80	04	04

NOTE: Question Paper should contains Part-A & Part -B

Part-A: Four Questions : Each 5 marks Total : 4x5 =20 marks

Part-B: Four Questions, the student has to answer TWO only with Each : 20 marks Total : 20x2 = 40 marks

OBJECTIVES

On the completion of the course the student should be able to comprehend the following

1.0 Comprehend the Graphical Symbols, View of fuses couplings and bearings

1.1 Draw standard symbols of electrical components and fixtures

1.2 Draw Sectional and end view of Rewirable fuse

1.3 Draw Sectional and end view of HRC fuse

1.4 Draw sectional elevation and end view of Flange coupling (Protected type)

1.5 Draw sectional elevation and end views of following bearings

(a) Ball Bearing (b) Roller Bearing.

1.6 Draw the sectional elevation and end views of end plate with bearing

2.0 Draw the different views of DC machines

2.1 Draw views, including sectional views of yoke and pole assembly

2.2 Draw sectional view of armature of DC machine

2.3 Draw sectional views of commutator of a DC Machine

2.4 Draw Sectional elevation and end view of a DC Machine

3.0 Draw the views of Transformers

3.1 Draw different core sections of a Transformer.

3.2 Draw sectional views of a single-phase single stepped core type transformer from the given data

3.3 Draw sectional views of a 3 phase three stepped core type transformers from the given data

4.0 Draw the views of Induction motors

4.1 Draw the sectional view of stator of an induction motor

4.2 Draw the sectional view of Squirrel cage Rotor

4.3 Draw the sectional view of Slip ring rotor

4.4 Draw the sectional elevation and end view of assembled Squirrel cage induction motor.

4.5 Draw the sectional elevation and end view of assembled Slip ring induction motor

5.0 Develop DC and AC Windings

5.1 Draw winding diagram of a Single Layer Lap connected D.C Machine

5.2 Draw winding diagram of a Single Layer Wave connected D.C Machine

5.3 Draw winding diagram of a 1-phase single layer lap winding.

5.4 Draw winding diagram of a 1-phase single layer wave winding.

5.5 Draw winding diagram of a 3-phase single layer lap winding.

5.6 Draw winding diagram of a 3-phase single layer wave winding.

6.0 Draw the sketches of Substations and earthing systems

6.1 Draw the sketch of

i) 132 kV steel towers (single circuit and double circuit)

ii) 220kv steel towers (single circuit and double circuit).

6.2 Draw the line diagram of 33kV / 11kV substation.

6.3 Draw the line diagram of 220kV / 132kV substation.

6.4 Draw the the dimensioned sketch of

(i) Pipe Earthing

(ii) Plate Earthing

6.5 Draw the dimensioned sketch of

(i) Transformer yard Earthing

(ii) Sub-station Earthing

COURSE CONTENT

1. Views of fuse, switches

Views of fuses, Rewirable fuse, HRC fuse, Flange coupling, End plate with bearings.

2. DC machine parts: (Assembled views in section)

Stator yoke and pole assembly, Armature of a small DC machine, Commutator of DC machine.

3. Transformers

Core sections, sectional views of single- phase single stepped core type, three phase three stepped core type transformers.

4. Induction motors

Sectional elevation and end views of 3-phase Squirrel cage induction motor, 3-phase Slip ring induction motor.

5. DC and AC winding

Single Layer Lap and Wave Windings - Winding tables- -Brush location - Equalizer rings, A.C.1- phase and 3- single layer lap and wave winding.

6. Supporting structures **and earthing systems**

132 kV steel towers (single circuit and double circuit) 220kv steel towers (single circuit and double circuit). -single line diagram of 33KV/11KV substation and 220KV/132KV substation-pipe earthing, plate earthing, Transformer yard earthing, Substation Earthing.

REFERECES

1. G.B.Bharadwaja.-Electrical Engineering Drawing

2.Dargon.-Electrical Engineering Drawing

3.Narang.-Electrical Engineering Drawing

4.Surjit singh-Electrical Engineering Drawing

5. Dr S K Bhattacharya-Electrical Engineering Drawing .

DIGITAL ELECTRONICS & MICROCONTROLLERSLAB PRACTICE

Subject Title : Digital Electronics & Microcontrollers Lab Practice

Subject Code : EE-408

Periods/Week : 03

Periods/Semester : 45

TIME SCHEDULE

S.No.	Major Topics	No. Of Periods
1.	Logic Gates	09
2.	Combinational Logic Circuits	12
3.	Sequential Logic Circuits	12
4.	Micro Controllers	12
	Total	45

LIST OF EXPERIMENTS

OBJECTIVES

On completion of the course the student should be able to

I. Perform tests on different Digital Electronic circuits.

I. Digital Electronics

1. Construct and verify the truth tables of Basic gates - AND, OR, NOT gates
2. Construct and verify the truth tables of Universal gates - NAND, NOR gates
3. Construct and verify the truth tables of Exclusive OR & Half-adder using logic gates.
4. Construct and verify the truth table of Full adder circuit using logic gates.
5. Verification of truth tables for RS, RST Flip-flops.
6. Verification of truth tables for JK , D, T Flip-flops.

Execute the following programs using 8051 Microcontroller

1. Block transfer of data.
2. 8 – bit addition
3. Multi byte addition

4. Sum of given n numbers
5. Sum of first n natural numbers
6. 8 bit multiplication using MUL instruction

Competencies & Key Competencies to be achieved by the student

S. No	Experiment Name (Periods)	Competencies	Key Competencies
1.	Identify the given digital ICs and draw their pin diagrams (3)	Read the IC numbers. Identify the importance of numbering on the ICs Identify the no. of pins of each IC Identify the type of IC package. Draw the pin diagram of each IC from the data sheets Identify the no. of gates present in each IC. Identify the input and output pins Note down the important specifications from the data sheets Identify the power supply pins. Observe the layout on a bread board. Measure the output of the given dc power supply. Read the logic diagram for Each Gate Read the truth table of each gate. Apply inputs as per the truth table and observe the outputs. Identify basic gates and universal gates.	▪ Draw the pin diagram of each IC from the data sheets ▪ Remove an IC from the bread board using IC remover.
2.	Show NAND and NOR gates as universal gates. (3)	Identify two input NAND and NOR gate ICs Mount the NAND and NOR ICs properly on bread board. Read the pin diagrams of ICS. Find the input pins, out pins, power supply pins. Read the circuit diagrams. Rig up the circuit diagrams one by one Apply different input combinations as per truth table and observe the corresponding outputs. Show that NAND gate and NOR gate are universal gates.	▪ Rig up the circuit diagram. ▪ Apply the inputs and observing the outputs.
3.	Realize a given Boolean function after simplification and obtain its truth table (3)	Identify the no. of literals present in the given Boolean expression. Find the form of expression(SOP or POS) Simplify the Boolean expression Identify the logic gates required Find the sourcing and sinking characteristics of logic gates from the data sheets. Draw the logic diagram. Find the Required logic ICS. Rig up the circuit. Apply different input combinations as per truth table and note down the observations.	▪ Apply different input combinations as per truth table
		Identify the no. of inputs and outputs of half adder and full adder. Determine the truth tables of Half adder and full adder.	▪ Write the Boolean expressions. Simplify the ▪ Boolean

4.	Construct half adder and full adder and verify the truth tables. (3)	Write Boolean expressions for the output variables from the truth tables. Simplify the Boolean expressions. Draw the logic diagrams of half adder and full adder. Identify the logic gates required. Rig up the circuits. Verify the truth tables of half adder and full adder by applying different input combinations. Show that construction of full adder can be done using two half adders. Identify a 4-bit parallel adder IC	expressions. ▪ Determine the logic gates required.
5.	Verify the function of 74138 decoder IC. (3)	Draw the pin diagram of 74138 IC from the data manual. Identify the significance of numbering. Identify the input and output pins Identify the enable pins. Note down the active low and active high pins. Read the truth table. Read the logic diagram. Rig up the circuit Apply the inputs to the enable inputs properly. Check the effect of enable inputs. Apply the inputs as per the truth table and observe the outputs.	▪ Identify the enable pins. ▪ Note down the active low and active high pins ▪ Check the effect of enable inputs.
6.	Verify the working of Multiplexer (Using IC 74153) (3)	Draw the pin diagram of 74153 IC from the data manual. Identify the input and output pins Identify the enable pins. Note down the active low and active high pins. Read the truth table. Read the logic diagram. Rig up the circuit Apply the inputs to the enable inputs properly. Check the effect of enable inputs. Apply different inputs as per the truth table and observe the outputs. Find applications of MUX Identify different multiplexers. Construct and test simple circuit using a multiplexer.	▪ Identify the enable pins. Note down the ▪ active low and active high pins ▪ Checking the effect of enable inputs. ▪ Identifying different multiplexers.
7.	Verify the functional table of 4-bit magnitude comparator 7485IC. (3)	Determine the function of magnitude comparator. Draw the pin diagram of 7485 IC from the data manual. Identify the pins to which one 4-bit no. is to be applied. Identify the pins to second 4-bit no. is to be applied Identify the output pins and note down their significance. Identify the cascading pins and note down their significance. Read the functional table of 7485 from the manual Observe the difference between functional table and	▪ Identify the pins to which one 4-bit no. is to be applied. Connect two 7485 ▪ ICs in cascade and observe the working of 8-bit magnitude comparator

		truth table. Rig up the circuit Apply the inputs and verify the functional table. Connect two 7485 ICs in cascade and observing the working of 8-bit magnitude comparator.	
8.	Construct and verify the truth tables of NAND & NOR latches (3)	Identifying the two input NAND and NOR ICs. Drawing the pin diagram of NAND and NOR ICs. Mounting the ICS on the bread board properly. Reading the logic diagram Rigging up the circuit diagram Applying inputs as per truth table and observe the outputs. Visualizing a latch can store one bit of data. Comparing truth tables of NAND and NOR latches. Observing the forbidden state in each latch.	▪ Visualizing a latch ▪ Observing the forbidden state in each latch.
9.	Construct clocked RS FF using NAND gates and Verify its truth table (3)	Identify the required digital ICs on the digital trainer kit Observe the clock circuitry on the trainer kits. Draw the pin diagrams of required ICs from the data manual Read the circuit diagrams Construct clocked RS FF Apply inputs and observe the outputs. Observe the effect of clock Identify the no. of FFs present in 7476 IC Observe the preset and clear inputs of 7476 Apply the inputs and clock to the 7476 and verifying the truth table Observe the effect of Pr and CLR inputs of 7476. Construct T and D FF using 7476. Observe the outputs for the inputs as per the truth table. Apply continuous clock to T flip flop and observe the output.	▪ Observe the preset and clear inputs of 7476 ▪ Apply continuous clock to T flip flop.
10.	Working with Microcontroller Kits and Simulators (3)	Familiarization of 8051 Microcontroller Kit Familiarization of 8051 simulator EDSIM 51 Write small ALP to demonstrate different register addressing techniques	▪
11.	Practicing Arithmetic instructions of 8051 (3)	Write an ALP to demonstrate Addition, subtraction, division and multiplication of 8 bit numbers using immediate data access. Write an ALP to Add and Subtract 16 bit numbers Write an ALP to Square and Cube program Write an ALP to find LCM of given numbers Write an ALP To find HCF of given numbers	
12.	Interfacing Switches and LEDS to 8051 (3)	Draw the practice diagrams List the tools required List different LEDS Identify the leads of LED Check the working of switch using DMM Check the continuity of Relay using DMM Implement of key de-bouncing (hardware).	▪ Identify leads of led with observation ▪ Identify color of LED, ▪ Note R value for current limiting ▪ Make relay connections

A.C. MACHINES LABORATORY PRACTICE – I

Subject Title	**:**	**A.C .Machines Laboratory Practice - I**
Subject Code	**:**	**EE- 409**
Periods/Week	**:**	**03**
Periods/Year(Sem)	**:**	**45**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
I.	**Performance of single phase transformers**	**09**
II.	**Sumpner's test and Scott connection**	**09**
III.	**Parallel operation of transformers and oil testing kit**	**09**
IV.	**Alternators**	**12**
V.	**Industrial Visit**	**06**

OBJECTIVES (LIST OF EXPERIMENTS)

Upon completion of the course the student shall be able to

I. Performance of single phase transformers.

1. Conduct load test on 1-phase Transformer and obtain efficiency and regulation
2. Conduct O.C. and S.C. tests on 1-phase Transformer and from the result
   a) Draw the equivalent circuit.
   b) Calculate efficiency at various loads and power factor's.
   c) Find the load at which maximum efficiency occurs.
   d) Calculate All-day efficiency for the given load cycle of 24 hours.

II. Sumpner's test and Scott connection.

3. Obtain the efficiency and regulation of two similar 1-phase transformers by conducting sumpner's test.
4. Conduct scott connection (T- connection) on transformers.

III. Parallel operation of transformers and oil testing kit

5. Connect two identical 1-ph transformers in parallel and observe the load sharing.
6. Obtain the Dielectric Strength of transformer oil using oil testing kit.

IV. Alternators

7. Conduct (direct) load test on Alternator and obtain voltage regulation.
8. Obtain the regulation of Alternator by using synchronous impedance method.
9. Synchronise the given Alternator with supply mains by using bright lamp method.

V. Industrial visit

10. Visit a 33/11 KV Substation
    i) Observe the connections of 3-phase power transformers.
    ii) Draw the wiring diagram of their parallel operation.
    iii) List the various equipments used by noting down their ratings.

iv) Prepare a report on the functioning of various equipments.

Key competencies to be achieved by the student

S.No	Experiment title	competencies	Key competencies
1	Performance of single phase transformers	▪ Draw the required circuit diagram. ▪ Identify the different terminals of the given 1-ph transformer. ▪ Interpret the name plate details. ▪ Select proper supply terminals. ▪ Select proper range and type of meters. ▪ Make connections as per circuit diagram. ▪ Follow the precautions to be taken(ex: Check for loose and/or wrong connections if any and rectify). ▪ Follow the instructions and increase the given load gradually and tabulate the observations. ▪ Draw the efficiency curve and locate the maximum efficiency point.	• Identify the different terminals of 1-ph transformer. • Select proper range and type of meters • Increase the given load gradually
2	Conduct Sumpner's test ,Perform Scott connection and conduct parallel operation of Transformer.	▪ Select proper range and type of meters. ▪ Make connections as per circuit diagram. ▪ Follow the instructions and perform sumpner's test by giving required rated voltage on primary side. ▪ Check for series opposition (back to back) connection on secondary side. ▪ Give required reduced voltage on secondary side. ▪ Tabulate observations. ▪ Calculate efficiency and regulation. ▪ Identify main and teaser trans formers and their terminals ▪ Give the required 3-ph supply. ▪ Take readings on both 3-ph and 2-ph side. ▪ Interpret the readings and verify 3-ph to 2-ph transformation. ▪ Conduct polarity test and ascertain the relative polarities of secondary windings for parallel operation of Transformers.	• Give required rated voltage on primary side. • Check for series opposition (back to back) connection on secondary side. ▪ Identify main and teaser trans formers and their terminals
3	Connect two identical 1-ph transformers in parallel and observe the load sharing.	▪ Draw the required circuit diagrams (main diagram and diagram for polarity test). ▪ Interpret the name plate details and labelling on transformers. ▪ Conduct polarity test and ascertain the relative polarities of secondary windings. ▪ Increase load gradually and tabulate observations. ▪ Interpret the readings and the load sharing details .	▪ Polarity test ▪ Load shared by the transformers in parallel
4	Obtain the Dielectric Strength of transformer oil using oil testing kit	▪ Pour carefully the required quantity of transformer oil in the oil chamber . ▪ Increase voltage gradually up to flash point. ▪ Note down the reading of the breakdown voltage.	▪ Select Proper Oil to test. ▪ See at what point of voltage flash over

			occurs
5	Performance of Alternators	▪ Draw the required circuit diagram. ▪ Identify the different terminals of 3-ph Alternator, exciter and prime mover . ▪ Interpret the name plate details. ▪ Select proper supply for prime mover and exciter. ▪ Select proper range and type of meters. ▪ Make connections as per circuit diagram. ▪ Increase the given load gradually and tabulate the observations. ▪ Calculate regulation at each load. ▪ Select proper supply for armature resistance test. ▪ Make connections for armature resistance test. ▪ Give required voltage , take readings and obtain armature resistance . ▪ Calculate synchronous impedance and regulation. ▪ Give required field current . ▪ For bright lamp method, Synchronise the alternators when all the conditions are satisfied.	▪ Select proper supply for prime mover and exciter. ▪ Select proper supply for armature resistance test ▪ For bright lamp method, Synchronise the alternators
6	Report on Industrial visits	▪ Understand its layout ▪ Draw the wiring diagram ▪ Writing a report	• Writing a report

COURSE CONTENT

1. **Performance of single phase transformers :**

Load test on 1-ph transformer - obtaining the equivalent circuit parameters, efficiency and voltage regulation of 1-phase transformer by conducting O.C and S.C test.

2. **Sumpner's test and Scott connection :**

Obtaining the efficiency and regulation of two similar 1-phase transformers by conducting sumpner's test - scott connection(T- connection) on transformers.

3. **Parallel operation of transformers and oil testing kit :**

Connection of two 1-ph transformers in parallel and observing the load sharing- Testing the dielectric strength of transformer oil using oil testing kit.

4. **Alternators :**

Load test on Alternator – obtaining the regulation of alternator by using synchronous Impedance method – Synchronisation of the given Alternator with supply mains by using bright lamp method.

5. **Industrial visits:**

Connections of 3-ph power transformers and their parallel operation in a 33/11 KV substation-functions of various equipments.

PROGRAMMING IN C LAB

Subject Title : Programming in C lab
Subject Code : EE - 410
Periods per Week : 3
Periods per Year : 45

LIST OF EXPERIMENTS

1. Exercise on structure of C program
2. Exercise on Keywords and identifiers
3. Exercise on constants and variables
4. Execution of simple C program
5. Exercise on operators and expressions
6. Exercise on special operators
7. Exercise on input and output of characters
8. Exercise on formatted input and output
9. Exercise on simple if statement
10. Exercise on if..else statement
11. Exercise on else..if ladder statement
12. Exercise on switch statement
13. Exercise on conditional operator
14. Exercise on while statement
15. Exercise on for statement
16. Exercise on do..while statement
17. Exercise on one dimensional arrays
18. Exercise on two dimensional arrays
19. Exercise on structure
20. Exercise on array of structures

The competencies and key competencies to be achieved by the student

S.No.	Name of the experiment	Objectives	Key Competencies
1	Exercise on structure of C program	For a given C program, identify the different building blocks	❖ Identify different building block in a C program
2	Exercise on Keywords and identifiers	For a given C program identify the keywords and identifiers	❖ Identify different keywords ❖ Check whether the keywords are in lowercase ❖ Differentiate identifiers and keywords
3	Exercise on constants and variables	For a given C program identify the constants and variables	❖ Identify the constants ❖ Identify the variables ❖ Declare variables with proper names ❖ Know the assignment of values to variables
4	Execution of simple C program	Execute a simple C program	❖ Acquaint with C program editing ❖ Compile the program ❖ Rectify the syntactical errors ❖ Execute the program
5	Exercise on operators and expressions	Write a C program that uses different arithmetic operators	❖ Identify different arithmetic operators ❖ Build arithmetic expressions ❖ Identify the priorities of operators ❖ Evaluate arithmetic expression ❖ Compile the program ❖ Rectify the syntactical errors ❖ Execute the program ❖ Check the output for its correctness
6	Exercise on special operators	Write a C program that uses special operators	❖ Identify different special operators ❖ Build expressions using special operators ❖ Compile the program ❖ Rectify the syntactical errors ❖ Execute the program ❖ Check the output for its correctness
7	Exercise on input and output of characters	Write a C program for reading and writing characters	❖ Know the use of getchar() function ❖ Know the use of putchar() function ❖ Compile the program ❖ Rectify the syntactical errors ❖ Execute the program ❖ Check whether the correct output is printed for the given input
8	Exercise on formatted input and output	Write a C program using formatted input and formatted output	❖ Know the use of format string for different types of data in scanf() function ❖ Know the use of format string for different types of data in printf() function ❖ Check whether the data is read in correct format ❖ Check whether the data is printed in correct format

9	Exercise on simple if statement	Write a C program using simple if statement	❖ Build a relational expression ❖ Use the if statement for decision making ❖ Rectify the syntax errors ❖ Check the output for correctness
10	Exercise on if..else statement	Write a C program using if..else statement	❖ Build a relational expression ❖ Use the if..else statement for decision making ❖ Rectify the syntax errors ❖ Check the output for correctness
11	Exercise on else..if ladder statement	Write a C program using else..if ladder statement	❖ Use else..if ladder statements with correct syntax ❖ Rectify the syntax errors ❖ Debug logical errors ❖ Check the output for correctness
12	Exercise on switch statement	Write a C program using switch statement	❖ Use switch statement with correct syntax ❖ Identify the differences between switch and else..if ladder ❖ Rectify the syntax errors ❖ Debug logical errors ❖ Check the output for correctness
13	Exercise on conditional operator	Write a C program using (**?** **:**) conditional operator	❖ Build the three expressions for conditional operator ❖ Use conditional operator with correct syntax ❖ Rectify the syntax errors ❖ Debug logical errors ❖ Differentiate conditional operator and if..else statement
14	Exercise on while statement	Write a C program using while statement	❖ Build the termination condition for looping ❖ Use while statement with correct syntax ❖ Check whether correct number of iterations are performed by the while loop ❖ Rectify the syntax errors ❖ Debug logical errors
15	Exercise on **for** statement	Write a C program using for statement	❖ Build the initial, increment and termination conditions for looping ❖ Use for statement with correct syntax ❖ Rectify the syntax errors ❖ Debug logical errors ❖ Check whether correct number of iterations are performed by the **for** loop ❖ Differentiate **for** and **while** statements
16	Exercise on **do..while** statement	Write a C program using do statement	❖ Build the termination condition for looping ❖ Use do statement with correct syntax ❖ Rectify the syntax errors ❖ Debug logical errors ❖ Check whether correct number of iterations are performed by the while loop ❖ Differentiate **do..while,while** and **for** statements

17	Exercise on one dimensional arrays	Write a C program to create and access one dimensional array	❖ Create a one dimensional array with correct syntax ❖ Store elements into array ❖ Read elements from array ❖ Validate boundary conditions while accessing elements of array ❖ Rectify the syntax errors ❖ Debug logical errors ❖ Check for the correctness of output for the given input
18	Exercise on two dimensional arrays	Write a C program to create and access two dimensional array	❖ Create a two dimensional array with correct syntax ❖ Store elements into array ❖ Read elements from array ❖ Validate boundary conditions while accessing elements of array ❖ Rectify the syntax errors ❖ Debug logical errors ❖ Check for the correctness of output for the given input
19	Exercise on structure	Write a C program using structure	❖ Define a structure with correct syntax ❖ Identify different members of a structure ❖ Declare a structure variable ❖ Access different members of structure ❖ Observe the size of the structure ❖ Rectify the syntax errors ❖ Debug logical errors ❖ Check for the correctness of output for the given input
20	Exercise on array of structures	Write a C program to create an array of structures and store and retrieve data from that array	❖ Define a structure with correct syntax ❖ Identify different members of a structure ❖ Declare a structure variable ❖ Create an array of structure ❖ Access individual element of the array of structure ❖ Access different members of structure ❖ Rectify the syntax errors ❖ Debug logical errors ❖ Check for the correctness of output for the given input

ELECTRICAL MANAGEMENT AND ENTREPRENEURSHIP

Subject Title : Electrical Management and Entrepreneurship
Subject Code : EE –501
Periods/Week : 04
Periods per Semester : 60

TIME SCHEDULE

sno	major topics	periods	weightage of marks	short answer questions	essay type questions
1	Principles of Management	3	3	1	
2	Human Resource management	4	6	2	
3	Financial management	4	6	2	
4	Project management	6	10		1
5	Power Transmission/Distribution Management	10	23	1	2
6	Electrical power substations management	10	23	1	2
7	Electrical power plants/stations management	12	23	1	2
8	Electrical Legislations	6	10		1
9	Entrepreneurship	5	6	2	
	Total	**60**	**110**	**10**	**8**

OBJECTIVES

On completion of the course the student will be able to comprehend the following

1.0 Understand the Principles of management, Organizational structure and behavior

1.1 Define industry, commerce, Trade and business.

1.2 Know the need for management.

1.3 Explain the principles of scientific management.

1.4 Understand functions of Management.

1.5 Differentiate between management and administration.

1.6 Understand the need of organisation structure of an industry.

1.7 Understand the Line, Line & Staff and Functional organisations.

1.8 List the merits & demerits and limitations of Line, Line & Staff and Functional organisations.

1.9 List different departments in a large scale industry i.e. a)GENCO, b)TRANSCO, c)DISCOM etc.

1.10 Understand organisational behavior with reference to power sector and related organizations.

1.11 List out different leadership models.

2.0 Appreciate the need for Human Resource Management

2.1 Define Personal Management and Staffing.

2.2 Explain the functions of Personal Management

2.3 State the importance of HR Planning.

2.4 Explain the various Recruitment Procedures.

2.5 Explain the need for Training & Development .

2.6 State the different types of Leaderships

2.7 State Motivation theories.

2.8 Explain the Maslow's Theory of Motivation

2.9 Explain the Causes of accident and Safety precautions to be followed.

3.0 Explain the basics of Financial Management

3.1 State the Objectives of Financial Management.

3.2 State the Functions of Financial Management.

3.3 List the types of Capitals.

3.4 List the Sources of raising Capital.

3.5 Describe Profit & Loss Account (only concepts) .

3.6 Describe the proforma of Balance Sheet.

4.0 Explain the importance of Project Management

4.1 State the meaning of Project Management.

4.2 Describe the CPM & PERT Techniques of Project Management.

4.3 Identify the critical path and find the project duration.

4.4 Explain the concept of Break Even Analysis

4.5 Define Quality and State the concept of Quality.

4.6 Describe the various Quality Management systems.

4.7 Explain the importance of Quality control, Quality Circle.

4.8 State the principles of Quality Assurance.

4.9 State the concepts of TQM.

4.10 State the constituents of ISO 9000 series standards.

5.0 Power Transmission & Distribution Management

5.1 Identification of Electrical Load

5.2 Identification of route for the Electrical power transmission and distribution line

5.3 Feasibility study of the route for the Electrical power transmission and distribution line

5.4 Planning of construction of the Electrical power transmission and distribution line

5.5 Execution of construction of the Electrical power transmission and distribution line

5.6 Organising and Control of construction of the Electrical power transmission and distribution line

6.0 Electrical Substations Management

6.1 Identification of Electrical Load distribution

6.2 Identification of the site for the Electrical Power Substation

6.3 Feasibility study of the site for the Electrical Power Substation

6.4 Planning of construction of the Electrical Power Substation

6.5 Execution of construction of the Electrical Power Substation

6.6 Organising and control of construction of the Electrical Power Substation

7.0 Power Plants/Stations Management

7.1 Identification of Electrical Load and it's distribution

7.2 Identification of site for the Electrical Power Plant

7.3 Feasibility study of the site for the Electrical Power Plant

7.4 Planning of construction of the Electrical Power Plant

7.5 Execution of construction of the Electrical Power Plant

7.6 Organising and control of construction of the Electrical Power Plant

8.0 Electrical Legislations

8.1 Salient features of the Electricity Act, 2003

8.2 Salient features of the Indian Electricity Rules, 1956

8.3 Salient features of the Factory Act

8.4 Salient features of the ESI Act

8.5 Salient features of the Work men Compensation Act

8.6 Salient features of the Industrial Dispute Act

9.0 Understand the Role of Entrepreneur in economic development.

9.1 Outline the concepts of Entrepreneurship.

9.2 Define the word entrepreneur.

9.3 Determine the role of Entrepreneurship.

9.4 Explain the requirements of an entrepreneur.

9.5 Determine the role of entrepreneurs in promoting Small Scale Industries.

9.6 Explain the method of site selection.

9.7 Outline the method of plant layout.

9.8 List the financial assistance programmes.

9.9 List out the organisations that help an entrepreneur.

COURSE CONTENTS

1. Principles of management, Organizational structure and behaviour

Definitions of Industry, Commerce and Business. Principles of Scientific Management, functions of management. Difference of administration and management. Role of industry, types of Organisations, Line and Staff and functional organisations. Advantages and limitations, departments in a large scale industry i.e Power sector and related Electrical Organisations. Assessing applicants, selection, Leadership models.

2. 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.

3. Finance Management

Introduction – Objectives of Financial Management – Types of capitals – sources of raising capital –Concept of Profit loss Account – Concept of balance sheet – proforma.

4. Project Management

Introduction – CPM & PERT – concept of Break event Analysis – quality system - Definition of Quality , concept of Quality , Quality control, Quality Assurance, Introduction to TQM-ISO 9000 series standards.

5. Power Transmission & Distribution Management

Concept Electrical Load, Alignment route for the Electrical power transmission line, Feasibility study of the route for the Electrical power transmission line, Planning of construction of the Electrical power transmission line, Execution of construction of the Electrical power transmission line, Organising and control of construction of the Electrical power transmission line

6. Electrical Power Substations Management

Concept of Electrical Load distribution, Load curves, Identification of the site for the Electrical Power Substation, Feasibility study of the site for the Electrical Power Substation, Planning of construction of the Electrical Power Substation, Execution of construction of the Electrical Power Substation, Organising and control of construction of the Electrical Power Substation

7. Power Plants/Stations Management

Identification of Electrical Load and it's distribution, Identification of site for the Electrical Power Plant, Feasibility study of the site for the Electrical Power Plant, Planning of construction of the Electrical Power Plant, Execution of construction of the Electrical Power Plant, Organising and control of construction of the Electrical Power Plant.

8. Electrical Legislations

Salient features of the Electricity Act, 2003, Indian Electricity Rules, 1956, the Factory Act, the ESI Act, the Work men Compensation Act, the Industrial Dispute Act etc.

9. Role of Entrepreneur & Entrepreneurial Development.

Concept, definition, role, expectation, entrepreneurship Vs Management, promotion of S.S.I. Self – employment schemes. site selection, plant layout, profile and requirement, Institutional support needed, financial assistance programmes.

REFERENCE BOOKS

1. Industrial Engineering and Management -by O.P Khanna
2. Production Management- by Buffa.
3. Engineering Economics and Management Science - by Banga & Sharma.
4. S.S.I Hand Book by S.B.P. Publishers.
5. Personnel Management by Flippo.
6. Entrepreneurship – by NITTT&R, Chennai.
7. Relevant manuals by the department GENCO/TRANSCO/DISCOM etc

A.C. MACHINES – II

Subject Title : A.C. MACHINES –II
Subject Code : EE-502
Periods/ Week : 05
Periods /Semester : 75

TIME SCHEDULE

SNo	Major topics	Periods	Weightage marks	Short answer type questions	Essay type questions
1	Synchronous Motors	20	29	3	2
2	3-Φ Induction Motors	30	49	3	4
3	1-Φ Induction Motors	15	19	3	1
4	Commutator Motors and Special purpose Motors	10	13	1	1
	Total	75	110	10	8

OBJECTIVES

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

1.0 Comprehend the working of synchronous motors.

1.1 Principle of Production of Rotating Magnetic Field in 3-phase System.
1.2 Explain the construction of synchronous motor and it's parts
1.3 Explain the principles of working of synchronous motors.
1.4 Explain the performance of synchronous motor on Load with phase diagrams.
1.5 Explain the effects of varying excitation at constant load with phasor diagrams,
1.6 Explain the significance and account for the shape of 'V' curves, Inverted V curve,
1.7 Explain how a Synchronous motor can be used as a Synchronous condenser.
1.8 Explain the phenomenon of HUNTING.
1.9 State "How HUNTING is prevented"?
1.10 Explain the starting methods of synchronous motor by (a).Auxiliary motor and (b) Damper winding
1.11 List the applications of synchronous motor.

1.12 Trouble shooting and Maintenance of Synchronous motors.

2.0 Comprehend the working of 3 phase Induction Motors,

2.1 Explain the advantages of Induction Motors.

2.2 Explain the construction of Induction motor- slip ring and squirrel cage

2.3 State the principle of working of 3 phase induction motor.

2.4 Explain working of 3 phase induction motor on no load –on Load

2.5 (a). Derive the equation relating TORQUE, POWER and SLIP.
(b). Draw Torque – Slip curves,

2.6 Explain how an induction motor is treated as a generalized transformer.

2.7 Torque Equation, Power flow diagrams, Efficiency

2.8 Explain : (a) No-load test (b) Blocked rotor test and
(c) Draw circle diagram with the help of above tests.

2.9 Solve problems on the evaluation of the performance of induction motors.
With given data.

2.10 Explain methods of starting of induction motors.

2.11 Sketch the circuit diagram and explain the working of (a).D.O.L. starter.
(b).Star/Delta Starter.
(c).Auto – Transformer starter. (d). Rotor resistance starter.

2.12 Explain construction features of double cage rotor motor.

2.13 Explain the speed control of inductor motors by (a). Frequency changing and
(b). Pole changing methods.
(c). Injecting voltage in rotor circuit. (d).Cascading

2.14 State the applications of inductor motors

2.15 Compare synchronous motors with induction motors.

2.16 Trouble shooting and Maintenance of 3-Φ Induction motors.

3.0 Comprehend the working of I phase induction motors.

3.1 State the types of I phase induction motors.

3.2 Explain the principle of working of 1 – phase Induction motor. a)double field revolving, b)cross field theory

3.3 Explain why a Single-phase Induction motor is not Self starting motor.

3.4 Explain the working of split phase motor, capacitor start motor and shaded pole motor.

3.5 Compare with 3-Φ induction motors

3.6 Trouble shooting and Maintenance of 1-Φ Induction motors.

4.0 Comprehend the working of single phase Commutator motors and Special purpose Motors

4.1 State the construction and working of different types of single phase Commutator motors- AC Series motor, universal motor, stepper motor, permanent magnet brushless motor.

4.2 Explain applications of above motors.

4.3 Trouble shooting and Maintenance of 1-Φ Commutator motors.

COURSE CONTENTS

1. Synchronous Motors

Introduction - Rotating Magnetic field, synchronous speed, parts of synchronous Motor – Excitation of rotor working Principle – Back EMF – Resistance and synchronous Reactance – Effects of Load, Vector diagrams – Load Angle, power relation, Effects of change of Excitation at constant Load, Vector diagrams for:(a).Normal, (b). Under and c)Over excitation conditions, Effects of Excitation on Armature current and power factor, Relation between Back EMF applied voltage, Simple problems - V – Curves and inverted V – curves ,constant power lines – Hunting and its undesirable Effects – Methods of Countering hunting, starting Device necessity – Methods of starting , Applications of synchronous motor. When used as synchronous condenser, Calculation of Motor Ratings, problems. Trouble shooting and Maintenance of Synchronous motors.

2. Three Phase Induction Motors

Introduction – Constructional features and differences in respect of cage and wound rotor types. Principle of working & self starting features, actual rotor speed and synchronous speed, slip. Effect of loading on slip – frequency and magnitude of rotor EMF and reactance – Expression for rotor current on no load and on Load – problems. Induction motor as a generalized transformer. Losses and Power transfer stage by stage from stator to rotor – Relational between rotor copper losses – Rotor output and rotor input derivation and problems. Torque equation derivation –

Starting torque, condition for maximum torque – Relation Between full load torque, starting Torque and maximum torque – Torque slip curves effects and variation rotor resistance and reactance on starting, full load and maximum torque. Effect of supply voltage on torque and speed, problems. Losses and efficiency – No load and blocked rotor tests, circle diagram from test data – Evaluation of torque – efficiency, problems on circle diagram. Starters for Induction motor – necessity, Direct Switching, D.O.L starter, Star / Delta starter, Auto Transformer starter and rotor resistance starters, simple problems. Double cage rotor motor – Improvement in performance features. Speed variation of induction motors ,Application of induction motors. Comparison of Synchronous and induction motors. Trouble shooting and Maintenance of 3-Φ Induction motors.

3. Single phase Induction Motors

Essential parts and constructional features of single phase motors – self starting -split phase, capacitors start, capacitor run and shaded pole types and Principles of working – Accessories like capacitors, centrifugal switch – function –reversal of rotation Applications and relative merits. Trouble shooting and Maintenance of 1-Φ Induction motors.

4. Commutator Motors (1-Φ) and Special purpose Motors

Essential parts and Constructional features of A.C series motor – principles of working – sparking, elimination methods, speed control, reversal of rotation and applications - Universal motor- parts, constructional features, principle of working, speed control and applications- Stepper motor – essential features , principle of working

and Applications- permanent magnet brushless motor – principle of working and applications. Trouble shooting and Maintenance of 1-Φ commutator motors.

REFERENCE BOOKS

1. Electrical Technology by B.L. Theraja
2. Electrical Technology by J.B. Gupta
3. Electrical Technology by H. Cotton
4. Performance and design of A.C. Machines by M.G, Say
5. Performance of A.C. Machines by Langsdorf
6. Electrical motors applications and control by M.V. Deshpande

POWER SYSTEMS - III

Subject Title : POWER SYSTEMS - III(SWITCHGEAR AND PROTECTION)

Subject Code : EE-503

Periods / week : 04

Periods / Semester : 60

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Switch Gear and Circuit Breakers	**10**	**19**	**03**	**1**
2.	Fuses and Reactors	**8**	**16**	**2**	**1**
3.	Protective Relays	**10**	**16**	**2**	**1**
4.	Protection of Alternators and Transformers	**12**	**23**	**1**	**2**
5.	Protection of transmission lines and Feeders	**11**	**20**	**-**	**2**
6.	Lightning arrestors and Neutral grounding	**9**	**16**	**2**	**1**
	Total	**60**	**110**	**10**	**8**

OBJECTVES

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

1.0 **Comprehend switch Gear and Circuit Breakers.**

1.1 State the types of faults in power system and their effects.

1.2 Define switch gear.

1.3 Classify switch gear.

1.4 State the purpose of isolators, air break switches and knife switches

1.5 Give the classification of the switches.

1.6 List the uses and limitations of the different types of switches.

1.7 Explain the phenomenon of arc, arc voltage, arc current and its effects.

1.8 State factors responsible for arc formation.

1.9 Describe the methods of arc quenching.

1.10 Classify the circuit breakers based upon medium of arc quenching.

1.11 State the principle of Bulk oil circuit breaker (B.O.C.B).

1.12 List the types of B.O.C.B.

1.13 Explain the working of each type of B.O.C.B

1.14 State the principle of Minimum oil circuit breaker (M.O.C.B).

1.15 Explain the working of M.O.C.B

1.16 Compare B.O.C.B and M.O.C.B

1.17 State the properties of SF_6gas .

1.18 State the principle of working of SF_6 circuit breaker.

1.19 Explain the working of SF_6 circuit breaker.

1.20 Explain the principle and working of Air blast circuit breaker(A.B.C.B).

1.21 Compare O.C.B, SF_6C.B and A.B.C.B.

2.0 Comprehend Fuses and Reactors

2.1 Explain fuse as protective device.

2.2 List various types of fuses.

2.3 Define the following

i) Rated current ii) Fusing current iii) Fusing factor

2.4 List different fuse materials.

2.5 State the importance of current limiting reactors.

2.6 List the types of reactors.

2.7 Describe the construction of the different types of reactors.

2.8 Draw the schematic diagram of reactor connections.

2.9 State the importance of short cicuit KVA.

2.10 Solve simple problems

3.0 Comprehend Protective Relays.

3.1 State the basic requirements of relays

3.2 State the important features of relays.

3.3 Classify the relays based upon

i) Principle of Operation ii) Time of operation.

3.4 Explain the working of thermal relay.

3.5 List the uses of thermal relay.

3.6 List the merits and demerits of thermal relay

3.7 Describe the working of solenoid plunger.

3.8 Describe the working of attracted armature relays.

3.9 List the uses of attracted armature relays.

3.10 Describe the construction and working of induction type over current relay.

3.11Describe the current setting, time setting and application of above relay.

3.12 Explain the principle of obtaining directional property in induction relays.

3.13Describe the working of directional over current induction relay.

3.14List the applications of directional over current induction relay.

3.15Explain the principle of working of impedance relay.

3.16 Describe the construction of impedance relay.

3.17List the applications of impedance relay.

3.18Explain distance relay

3.19 List the uses of distancerelay.

3.20Describethe two typesdifferential protection .

4.0 Understand the Protection of Alternator and Transformer.

4.1 List the probable faults in Alternator Stator and rotor .

4.2 State the effects of faults on Alternator Stator and rotor .

4.3 Describe the scheme of protection against excessive heating of stator and rotor.

4.4 Explain the differential protection for alternator stator.

4.5 Explain the earth fault protection for rotor.

4.6 Explain the split phase protection of alternator against inter turn short circuits.

4.7 Explain the need and working of field suppression protection.

4.8 List the possible faults in a transformer and mention their effects.

4.9 List the precautions to be taken for applying differential protection to transformers.

4.10 Explain differential protection of transformer.

4.11 Explain the working of Buchholtz relay and its protection scheme for transformer.

5.0 Understand the Protection of Transmission Lines and Feeders

5.1 Explain the different schemes of protection for single and duplicate bus bars.

5.2 Describe the transmission line and feeder protection.

5.3 Explain pilot wires and their effects.

5.4 Explain the protection of transmission lines using distance and impedance relays.

5.5 Explain the combined protection by using definite distance and time distance relays.

5.6 Explain protection of radial feeders using time graded relays.

5.7 Explain protection of parallel feeders using directional relays.

5.8 Explain protection of ring main feeder using directional relays.

5.9 Derive a relation between number of sections and minimum relay time.

5.10 Explain differential protection for parallel feeders of transmission lines.

6.0 Understand the Lighting Arrestors and Neutral Grounding.

6.1 Define surge.

6.2 List the types of surges

6.3 Give reason for the causeof surges..

6.4 Explain the scheme of surge protection with diagram.

6.5 Explain the types of lightning arrestors or surge diverters.

6.6 List the six types of lighting arrestors.

6.7 Describe the construction and working of following types of lighting arrestors.

i)Rod gap ii)Sphere gap iii)Horn gap iv)Valve type v)Thyrite type vi)Lead oxide

6.8 List the applications of above lighting arrestors.

6.9 Explain the necessity of neutral grounding .

6.10Givethe merits and demerits of neutral grounding.

6.11Describe the following methods of neutral grounding

i) Solid grounding ii)Resistance grounding iii)Reactance grounding iv)Voltage transformer grounding v)Zig-zag transformer grounding .

6.12Compare the different methods of neutral grounding.

COURSE CONTENT

1. Switch Gear and Circuit Breakers

Switch gear and their classification – Isolators, air break switches and knife switches-explain the phenomenon of arc, arc voltage, arc current and their effects – Factors responsible for arc and arc quenching. Circuit breakers and their classification based on the medium of arc quenching-B.O.C.B,M.O.C.B comparison – Properties of SF_6 gas and principles of SF_6 circuit breakers – Working of A.B.C.B,B.O.C.B, M.O.C.B, SF_6 C.B and their comparisons.

2. Fuses and Reactors

Fuse as protective device and differen types of fuses based on rated current,fusingcurrent,fusing factor-Reactors– Current limiting reactors and their necessity. Types of reactors and their construction – Equation for short circuit KVA and solve problems.

3. Protective Relays.

Requirements, Features of relays – Classifications based on principle of operation and time of operation –Thermal,Solenoid plunger and attracted armature relays-Their uses merits and demerits. Construction and working of induction type over current relays – Directional Over current relay Principle, construction and working of impedance, distance relay.

4. Protection of Alternators and transformers

Protection of Alternators Scheme of protection probable faults in alternators against excessive heating of stator and rotor.Differential protection-Earth fault protection for stator and rotor – Split phase protection for alternator against short circuits.Field suppression protection.Protection of Transformer, Possible faults and their types in the transformer –

Precautions required for protection – Differential protections and buchholz relay, protection against excessive heating of transformer oil.

5. Protection of transmission lines and Feeders

Transmission line and feeder protection- Pilot wires, protection of transmission lines using distance and impedance relays. Combined protection using definite distance and time distance relays – Protection of radial feeders, parallel feeders, ring main feeders using time graded directional relays.Bus bar protection-Single bus bar,duplicate bus bars.

6. Lighting Arrestors and Neutral grounding

Surge Protection- Need for Surge Protection -Surge types and causes of surges – Scheme of surge protection with diagram. Various types of LA's –Rod gap,Spheregap,Horn gap, Valve type, Thyritetype,Lead oxide, -Necessity of neutral grounding, its merits and de-merits- Methods of Grounding the neutral.

REFERENCE BOOKS

1. Principle of Power systems - V.K. Mehta
2. Electrical power systems - S.L. Uppal
3. Text book of Electrical power systems - SONY,GuptaBhatnagar
4. Electrical power systems- JB Gupta
5. Electrical power Systems - CL Wadhwa

6.Switch gear and Protection by Sunil S. Rao

POWER ELECTRONICS

Subject Title : Power Electronics

Subject Code : EE-504

Periods/Week : 04

Periods/Semester : 60

TIME SCHEDULE

S. no	Major Topics	No. of periods	Weightage of marks	Short questions	Essay questions
1	Power Electronic Devices	20	39	3	3
2	Converters, AC Regulators & Choppers	15	26	2	2
3	Inverters and Cyclo-converters	8	16	2	1
4	Speed control of AC / DC Motors	9	16	2	1
5	Application of Power Electronic	8	13	1	1

	circuits				
	Total	60	110	10	8

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the construction and working of Power Electronic Devices

1.1 List different thyristor family devices.
1.2 Draw the ISI circuit symbols for each device.
1.3 Describe constructional details of SCR
1.4 Explain the Operation of SCR.
1.5 Describe thetwo transistor analogy of SCR.
1.6 Explain the Volt – Ampere characteristics of SCR with the help of a diagram.
1.7 Draw the Gate characteristics of SCR
1.8 Mention the ratings of SCR.
1.9 Give the advantages of SCR as a switch.
1.10 List ten applications of SCR.
1.11 Explain the construction of GTO SCR
1.12 Compare the characteristics of GTO SCR and SCR.
1.13 Explain the Volt-ampere characteristics of Diac under forward / Reverse bias.
1.14 Explain the Volt-ampere characteristics of Triac under forward / Reverse bias.
1.15 State the four modes of Triac triggering.
1.16 Distinguish between SUS, SBS, SCS & LASCR
1.17 Explain SCR circuit triggered by UJT.
1.18 Explain power control circuits of the following
i)Diacs ii) Triacs and iii) SCR's.
1.19 Explain the working of the following

i)Reverse conducting thyristor (RCT) ii)Asymmetrical SCR (ASCR)
iii)Power BJT iv)Insulated gate Bipolar transistor (IGBT)
v)MOS-controlled thyristors (MCT)
by giving theirV-I characteristics.
1.20 State the necessity of Commutation in SCR's
1.21 Explain various methods of Commutation.
1.22 Describe the mechanism of protecting power devices.

2.0 Understand the working of Converters, AC regulators and Choppers.

2.1 Classify converters.
2.2 Explain the working of single-phase half wave controlled converter with Resistive and R-L loads.
2.3 Understand need of freewheeling diode.
2.4 Explain the working of single phase fully controlled converter with resistive and
R- L loads.
2.5 Explain the working of three-phase half wave controlled converter with Resistive load
2.6 Explain the working of three phase fully controlled converter with resistive load.
2.7 Explain the working of single phase AC regulator.
2.8 Explain the working principle of chopper.
2.9 Describe the control modes of chopper

2.10 Explain the operation of chopper in all four quadrants.

3.0 Understand the Inverters and Cyclo-converters

3.1 Classify inverters.
3.2 Explain the working of series inverter .
3.3 Explain the working of parallel inverter
3.4 Explain the working of single-phase bridge inverter.
3.5 Explain the working of three-phase inverter.
3.6 Explain the basic principle of Cyclo-converter.
3.7 Explain the working of single-phase centre tapped Cyclo-converter.
3.8 Applications of Cyclo-converter.

4.0 Understand speed control of DC / AC Motors

4.1 Mention the factors affecting the speed of DC Motors.
4.2 Describe speed control for DC Shunt motor using converter.
4.3 Describe speed control for DC Shunt motor using chopper.
4.4 List the factors affecting speed of the AC Motors.
4.5 Explain the speed control of Induction Motor by using AC voltage regulator.
4.6 Explain the speed control of induction motor by using converters and inverters (V/F control)

5.0 Understand the Applications of power electronic circuits

5.1 List any six applications of power electronic circuits.
5.2 Explain the Light dimmer circuit using DIAC/TRIAC with the help of a diagram.
5.3 Explain the Burglar alarm circuit using SCR with the help of a diagram.
5.4 Explain the Emergency lamp circuit using SCR with the help of a diagram.

5.5 Explain the Battery charger circuit using SCR with the help of a diagram.

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 & Gate characteristics, Forward break over voltage, latching current, holding current, turn on triggering time, turn off time - triggering of SCR using UJT- Necessity of Commutation- various methods of Commutation-protection of power devices.

2. Converters AC Regulators & Choppers

Classification of converters, single phase half wave fully controlled converter, freewheeling diode, single phase fully controlled converter, three phase half wave, three phase half wave andfull wave controlled converter , single phase ac regulator, choppers- Four quadrant operation –different modes of operation.

3. Inverters&Cyclo-converters

Classification of Inverters-basic series Inverter- parallel Inverter- single - phase bridge Inverter– Three phase bridge Inverter. Cyclo-converter – basic principle of operation- single-phase center tapped Cyclo-converter- applications of Cycloconverters.

4. Speed Control of DC/AC Motors

DC Motor control- Introduction-Speed control of DC shunt Motor by using converters and choppers

AC Motor Controls: speed control of induction Motor by using AC voltage controllers - V/F control (Converters and invertors control).

5. Application of Power Electronic Circuits

Light dimmer Circuit- Burglar alarm Circuit- Emergency lamp and Battery charger Circuit using SCR- Advantages of the above circuits.

REFERENCES

1 JamilAsghar -Power Electronics– PHI, New Delhi.
2. Chute -Industrial Electronics
1 Mithal- Industrial Electronics

2 P.C.Sen.-Industrial Electronics
3 Berde-Industrial Electronics
4 P.C.Sen.-Advanced Power Electronics
5 Harish Rai -Industrial & Power Electronics.
6 R.K.Sugandhi& KK Sugandhi -Thyristor(theory& applications)

7. Singh & kanchandeni – Power Electronics

ELECTRICAL DRIVES AND TRACTION

Subject Title **:ELECTRICAL DRIVES AND TRACTION**

Subject Code **: EE-505**

Periods/Week **: 05**

Periods/semester **: 75**

TIME SCHEDULE

Sl. No	Major Topics	Periods	Weightage of marks	Short questions	Essay questions
1.	Electrical Drives	10	13	1	1
2.	Electric Braking	9	13	1	1
3.	Domestic applications of Drives	10	13	1	1
4.	Industrial applications of Drives	10	16	2	1
5	Electric traction properties	15	16	2	1
6	Tractive Effort,Mechanics of traction & specific energy	15	26	2	2
7	Traction Equipment	6	13	1	1
	Total	75	110	10	8

1.0 AppreciatethedifferenttypesofElectricalDrives.

1.1 Define an Electric Drive.
1.2 Explain the concept of Electric Drive.
1.3 List the advantages of Electric Drives.
1.4 Draw the block diagram of an Electric drive
.5 State the function of each block in the block diagram of an Electric drive
1.6 List the factors governing the selection of electric drive.
1.7 Classify the drives.
i) Based on their operation ii) Based on their application
1.8 State the advantages and disadvantages of different types of drives.

1.9 Distinguish between an AC Drive and a DC Drive.
1.10 State the types of loads for which drives are needed
1.11 Draw the Load curves for different ratings of motors
1.12 Solve the Problems on the motor Ratings.
.13 State the need of load equalization
1.14 State the use of fly wheels
1.15 List the different types of enclosures and bearings
1.16 State the methods employed for reduction of noise

2.0 Understandbrakingofelectricmotors

2.1 State different systems of braking of electric motors.
i) Mechanical (ii) Compressed air (iii) Vacuum brake

(iv) Magnetic Brake (v) Electric Braking.
2.2 State advantages of electric braking over other forms of brake
2.3 Explain different methods of electric braking
2.4 Discuss the methods of plugging of the following motors

i) D.C. shunt motors ii) D.C. series motors iii) Induction Motor.
2.5 Solve the Problems on the above
2.6 Explain the method of Rheostatic braking of the following motors.i) D.C. shunt motors
ii) D.C.series motors.
2.7 Describe the method of Regenerative braking of the following motors

i) D.C. shunt motor ii) D.C series motor iii) Three-phase induction motor.
2.8 Solve the Problems on the above.

3.0 Understandthe DomesticapplicationsofDrives
3.1 List at least eight domestic applications of drives.
3.2 Select the suitable motors for the following drives
i) Domestic ii) refrigeration iii) Vacuum cleaner
iv) Washing machine (v) Mixies vi) Grindersvii) Air conditioners viii) Pumps.
3.3 Explain the working of the drives for the above applications.

4.0 IndustrialapplicationsofDrives
4.1 List atleast twelve industrial applications of drives.
4.2 Select the suitable motors for the following drives
(i) Steel mills (ii) sugar mills (iii) flour mills (iv) Cranes (v) Lifts & Hoists(vi)Lathes (vii) Drilling and Grinding machines (viii) Pump sets
(ix) Punches & Presses (x) Wood working machines (xi) Printing
xii) Belt conveyor (xiii) Textile mills (xiv) Paper mills (xv) Rolling mills
(xvi) Ship propulsion (xvii) Mines (xviii) Cement works.
4.3 Explain the working of the drives for the above applications.
4.4 Select a suitable motor and drive system for
i) Hard Disc ii) Computer Printer
4.5 Select a suitable motor and drive system for
i) Robot Arm ii) C.N.C.Machine

5.0 ELECTRICAL TRACION

5.1 Describe single-phase A.C. and composite systems
5..2 State the advantages and disadvantages of electric traction
5.3 List the types of services (main line, suburban and urban) Sketch thespeed-time Curves for the above services
5.4 State each stage of the speed-time curve with appropriate speedsused
5.5 State the importance of speed-time curves
5.6 Define Maximum speed, average speed and scheduled speed

5.7 List the factors affecting the scheduled speed
5.8 Sketch the simplified speed-time curves
5.9 Explain the practical importance of the above curves

5.10 Derive the expression for maximum speed, acceleration and retardation (Trapezoidal & Quadrilateral speed time curves)
5.11 Solve numerical examples on speed time curves

6.0 TRACTIVE EFFORT,MECHANICS OF TRACTION & SPECIFIC ENERGY CONSUMPTION

6.1 Explain the tractive effort
6.2 Derive the expression for tractive effort for acceleration, to overcomegravity pull and train resistance
6.3 Calculate the tractive effort under given conditions
6.4 Explain the mechanics of transfer of power from motor to driving wheel
6.5 Define 'Coefficient of adhesion'
6.6 List the factors affecting the coefficient of adhesion
6.7 State the typical values of coefficient of adhesion for steam, diesel andelectric Drives
6.8 State the methods of improving the coefficient of adhesion
6.9 Explain the term specific energy consumption
6.10 Derive the formulae for energy output of drive to
i) Accelerate
ii) To overcome friction
iii) To overcome gradient
6.11 List the factors affecting specific energy consumption

6.12 Solve simple problems on specific energy calculation under givenconditions

7.0 TRACTION EQUIPMENT

7.1 State the important requirements of traction motor
7.2 Explain the suitability of different motors (A.C& D.C) for traction
7..3 Explain with neat sketch the control of traction motor by autotransformer method in Single phase 25 kV system

7.4 Explain the purpose and material used for

a) Catenaryb) droppers
c)trolley wiresd) bow collector
e) Pantograph collector

7.5 Need of Booster Transformer.
7.6 Explain train lighting systems

COURSECONTENT

Electricaldrives

Definition and concept of Electric Drives -Advantages- factors governingselection of motors -nature of electric supply- DC & AC - Nature of Drives- Group drives- Individual drives their merits and demerits - Nature ofload - analysis of type of load- Operations required -matching of motorswith given loads - Rating of motors basing on temperature rise and loadequalization - purpose of load equalization- use of Flywheel - types ofenclosures and bearings - Reduction of noise

ElectricBraking

Braking - Types of Braking - Merits & de-merits of Electrical braking -Plugging applied to Shunt, Series and Induction Motor - Simple Problems - Rheostatic braking applied to Shunt, Series and Induction motors -Regenerative braking applied to shunt, series and Induction motor.

DomesticapplicationsofDrives

Electric motors used in Domestic applications , Refrigeration, Vacuumcleaners, Washing machines, Mixies, Grinders, Air conditioners, Pumps.

IndustrialapplicationsofDrives

Electric motors used in - Steel mills- Sugar mills - Flour mills- Cranes -Lifts -Hoists - Lathes -Drilling and Grinding machines - Pump sets -Punches & Presses - Wood working machines - Printing - Belt conveyor- Textile mills -Paper mills - Rolling mills - Ship propulsion -Mines -Cementworks.

ELECTERICAL TRACTION PROPERTIES

Introduction - different systems of train electrification - speed time curves -different types of train services, urban and sub-urban- factors affectingscheduled speed - problems tractive effort Derivation problems

TRACTIVE EFFORT ,MECHANICS OF TRACTION & SPECIFIC ENERGY CONSUMPTION

Mechanics of train movement - Coefficientof adhesion - factors affecting the coefficient of adhesion - Tractive effort -problems -Specific energy consumption – calculations –

TRACTION EQUIPMENT

Traction motorsA.C & D.C – control of traction motor by auto transformer –overhead equipment - Current collecting gears - Booster transformer –Train Lighting Systems.

REFERENCES

1.Hand book of process control - Lyptak
2.A first course on Electric Drives- S.K.Pillai.
3.Electrical motors applications and control by M.V.Deshpande
4.Electrical power by S.L.Uppal
5.Electrical power by J.B.Gupta
6. Electrical Technology Vol III by B L Theraja
7.Electric Traction by H. Partab
8..Electric Traction A.T. Dover
9.Electric Traction Hand Book Sir Isqqc Pitman & sons ltd., London
10 Utilisation of Electrical Energy.(in SI units) E.O. Taylor (Indian Edition)
11A course in Electrical Power (in SI units) J.B. Gupta

ELECTRICAL UTILISATION and AUTOMATION

Subject Title **:ELECTRICAL UTILISATION and AUTOMATION**

Subject Code **: EE-506(A)**

Periods/Week **: 05**

Periods/semester **: 75**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of marks	Short questions	Essay questions
1.	Electric Lighting	**20**	**29**	**3**	**2**
2.	Electric heating	**15**	**26**	**2**	**2**
3.	Basics of control systems	**10**	**13**	**1**	**1**
4.	Industrial control components	**15**	**16**	**2**	**1**
5	Programmable logic controllers	**15**	**26**	**2**	**2**
	Total	**75**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 **Understand the principles of lightings**

1.1 Explain the nature of light and of its propagation

1.2 State the units of wave length

1.3 Define

i) Plane and solid angles ii) luminous flux

iii) Luminous intensity iv) Lumen

v) Candle power vi) Illumination

vii) Brightness viii) Polar curve

ix) MHCP x) MSCP

xi) MHSCP

1.4 Explain the production of light by

i) Excitation ii) Ionisation

iii) Fluorescence and phosphorescence

1.5 List the types of lamps used for illumination for different situations such as

i) Domestic ii) Industrial

iii) Decoration iv) Advertisement

v) Street lighting schemes

1.6 Define glare

1.7 State the requirements of good lighting

1.8 List the lamp fittings used in domestic and Industrial applications

1.9 Draw different lamp fittings

1.10 State the uses and advantages of each type of Lamp fittings.

1.11 State the laws of illumination.

1.12 Explain the laws of illumination.

1.13 Solve Problems on Illumination

1.14 Define the terms:

i) Utilisation factor ii) Depreciation factor iii) Waste light factor

iv) Reflection factor v) Reduction factor vi) Absorption factor

vii) Luminous efficiency viii) Specific energy consumption ix)Space -height ratio

1.15 Design a simple lighting scheme for Indoor,

a) Drawing Halls

b) Assembly Halls.

c) Factory

2.0 Understand the principle of electric heating and its industrial applications

2.1 State the advantages of electric heating
2.2 List the requirements of good heating material
i) State the materials employed for heating

ii) Design of heater element and problems

2.3 Explain with legible sketch
i) Direct resistance heating

ii) Indirect resistance heating

2.4 State the industrial application of
i) Direct resistance heating

ii) Indirect resistance heating

2.5 Explain the different methods of temperature controls with legible sketch
2.6 Explain the different types of electric arc furnaces with legible sketch:
i) Direct arc furnace ii) Indirect arc furnace

2.7 Explain the basic circuit for electric arc furnace showing the arrangement of OCB Control panels, CTs through relays, furnace transformer and arrangement of

electrode movement

2.8 Explain the application of direct arc furnaces in industry
2.9 Explain the application of indirect arc furnaces in industry
2.10 Explain the principle of operations of induction furnaces with legible sketches (low and high frequency, core type and core less type)

2.11 List the industrial application of the following Furnaces.
i) core type ii) coreless type iii) high frequency type

2.12 State the principle of dielectric heating
2.13 List the industrial applications of the dielectric heating
2.14 Solve problems on Dielectric heating.

3.0 **Basics of control systems**
3.1 Differentiate between manual and automatic control
3.2 State the need for automation
3.3 List the advantages of automation
3.4 State the Basic terminology of control system
i) Process
ii) Controlled elements
iii) Controllers
iv) Controlled value
v) Reference point(Set point)
vi) Disturbance
vii) Automatic control system

3.5 State the differences between open loop and closed loop control system
3.6 Draw and explain the block diagram of open loop control system with examples like furnace temperature control , control of fluid level in a tank

3.7 State the need for feed back in a control system
3.8 Draw and explain the block diagram of closed loop control system with examples like furnace temperature control ,control of fluid level in a tank

3.9 Describe sequential control system with examples like washing machine, traffic light control.

3.10 Define transfer function of a closed loop system
3.11 Derive the expression for transfer function of a closed loop control system

4.0 Industrial control components

4.1 State the purpose and use of normally open and normally closed contacts
4.2 Mention the purpose and application of the following input control devices

i) Normally open push button
ii) Normally closed push button
iii) Break-make push button
iv) Selector switch
v) Limit switch
vi) Temperature switch
vii) Pressure switch
viii) Level switch
ix) Photo electric switch
x) Tachometer generator
xi) Encoder

4.3 Explain the construction and working principle of electromagnetic control relay
4.4 Explain the construction and working principle of Reed relay
4.5 Mention the purpose and application of the following output control devices

i) Pilot lamps
ii) Alarm
iii) Heater
iv) Solenoid
v) Solenoid valve
vi) Contactor
vii) Horn

4.6 Explain the construction and working principle of DC servo motor
4.7 Explain the construction and working principle of AC servo motor
4.8 List the advantages of servo motors
4.9 List the advantages of stepper motors
4.10 List the applications of servo motors
4.11 List the applications of stepper motors
4.12 Differentiate between hydraulic and pneumatic controllers
4.13 List the advantages and disadvantages of hydraulic controllers
4.14 List the advantages and disadvantages of pneumatic controllers

5.0 Programmable logic controllers

5.1 Define programmable logic controller

5.2 List the advantages of PLC over relay based control panel

5.3 Draw the block diagram of PLC and explain the major parts of a PLC

5.4 Differentiate between a PLC and a computer

5.5 Define PLC scan

5.6 State the applications of PLC

5.7 List the various PLC programming languages

5.8 Distinguish between relay schematicand ladder diagram language

5.9 Describe the relay type instructions used in PLC programming

i) XIC(Examine on)
ii) XIO(Examine off)
iii) OTE(output energize)
iv) OTL(output latch)
v) OTU(output unlatch)
vi) OSR(one shot relay)

5.10 Draw the ladder diagrams for

i) AND Gate
ii) OR Gate
iii) NOT gate

5.11Draw the ladder diagrams for

i) NAND Gate
ii) NOR Gate
iii) EX-OR gate
iv) EX-NOR gate

5.12Describe the TIMER instructions with timing diagrams used in PLC programming

i) TON (Timer on delay)
ii) TOFF (Timer off delay)
iii) RTON (Retentive on delay)

5.13Describe the COUNTER instructions with timing diagrams used in PLC

Programming

i) CTU (Count up)
ii) CTD(countdown)

5.14 Draw and explain the ladder diagrams for the following PLC based model

Applications

i) DOL starter
ii) Star delta starter
iii) Stair case lighting
iv) Traffic light control

5.15 State the concept of HMI

5.16 Mention the benefits of Distributed control system (DCS) over PLC

5.17 Mention the applications of distributed control system (DCS)

5.18 What is meant by SCADA?

5.19 Describe the components of SCADA

COURSE CONTENT

1. **Electric Lighting**

Nature of light and its production, electromagnetic spectrum physical spectrum - units of wave length - Terms and definitions plane and solid angle, luminous flux, Lumen, C.P. Illumination, brightness, polar curve, MHCP, MSCP, MHSCP, Principle of production of light by excitation, ionisation, fluorescence and phosphorescence - types of lamps - Requirements of good lighting different types of lamp fittings laws of illumination. Terms and factors used in design of lighting schemes for indoor - problems

2. **Heating**

Advantages of electric heating - requirements of good heating material and materials generally employed, direct resistance heating - principle and application design of heating element - Indirect resistance heating - Principle and applications - Temperature control of resistance furnaces - Electric arc furnaces - direct and indirect types - applications - Induction heating core type and coreless type - Applications - Dielectric heating - principle advantages and applications – problems on dielectric Heating.

3. Basics of control systems

Manual and automatic control-advantages of automation-basic terminology of control system-open loop and closed loop systems examples with block diagram-Types of feedback-definition and derivation of transfer function of closed loop control system

4.0 Industrial control components

Contact types-Normally open and normally closed contacts-input control devices-push button-selector switch-limit switch-temperature switch-pressure switch-level switch-photo electric switch-tachometer generator-encoder-output control devices-pilot lamps-alarm-heater-solenoid-solenoid valve-contactor-horn-DC servo motor-AC servo motor-stepper motor-Hydraulic and pneumatic controller

5.0 Programmable logic controllers

Definition of PLC-advantages of PLC-Block diagram-PLC scan-applications of PLC-programming languages-ladder diagram-Relay type instructions-ladder diagram for AND,OR,NOT,NAND,NOR,EX-OR,EX-NOR gates-ladder diagrams for timer and counter

instructions-Ladder diagrams for PLC based DOL starter,Star-Delta starter,stair case lighting and traffic light control-HMI-DCS-SCADA

REFERENCES

1. Electrical power S.L. Uppal
2. Electrical Utilisation Gupta
3. Utilisation of Electric Power Openshaw Taylor
4. Utilisation of Electric energy R.K. Gang
5. Programmable logic controllers Frank D Petruzuella
6. Industrial automation and process control -Jon Sterenson
7. Control Systems-N. K. Sinha-New age international (P) limited
8. Programmable Logic controllers –John W.Webb
9. Control of electrical machines-S.K Bhattacharya

ELECTRICAL UTILISATION AND MAINTENANCE

Subject Title : ELECTRICAL UTILISATION AND MAINTENANCE

Subject Code : EE-506 (B)

Periods/Week : 05

Periods/semester : 75

TIME SCHEDULE

SNo	Major topics	Periods	Weightage marks	Short answer questions	Essay type questions
1	Electrical Lighting	18	26	2	2
2	Electrical Heating	16	26	2	2
3	Electrical Welding	08	16	2	1
4	Testing of Domestic Appliances	18	26	2	2
5	Maintenance of Electrical Power devices	15	16	2	1
		75	110	10	8

OBJECTIVES

On completion of the study of the subject the student will be able to comprehendthe following.

1.0 Understand the principles of lighting.

1.1 Explain the nature of light and its propagation

1.2 Define

a) Plane and solid angles b) luminous flux c) Luminous intensity d) Lumen e) candle power

f) Illumination g) Brightness h) Polar curve i) MHCP j) MSCP k) MHSCP

1.3 List the types of lamps used for illumination for different situations such as domestic, industrial, decoration, advertisement and street lighting schemes

1.4 Define glare

1.5 State the requirements of good lighting

1.6 Explain different types of lamp fittings.

1.7 State the uses and advantages of each type

1.8 State and explain the laws of illumination

1.9 Solve problems on laws of illumination.

1.10 Define the terms:

a) Utilizationfactor b) Depreciation factor c) Waste light factor d) Reflection factor e) Reduction factor f) Absorption factor g) Luminous efficiency h) Specific energy consumption j)Space -height ratio

1.11 Design simple Indoor lighting schemes and solve problems on calculation of number of lamps required.

2.0 Understand the principles of electric heating

2.1 State the advantages of electric heating

2.2 List the requirements of good heating material

2.3 State the materials employed for heating

2.4 Explain Resistance heating - Direct and Indirect

2.6 List the Industrial applications of Resistance heating.

2.7 Explain different methods of temperature control of resistance heating with diagrams.

2.8 Explain Arc Heating - direct and indirect

2.9 List the Industrial applications of Arc Heating.

2.10 Explain Induction Heating – (Core type and Core less type)

2.11 Explain the principle of dielectric heating

2.12 List the industrial applications of dielectric heating

3.0 Explain the types, applications and equipments of electric welding

3.1 State different types of electric welding

3.2 Explain the principles of

i) Resistance Welding ii) Spot Welding

iii) Seam Welding iv) Butt Welding

v) Arc Welding vi) Metal Arc Welding

vii) Carbon Arc Welding

3.3 List the conditions for Successful Welding

3.4 Explain the characteristics of a welding generator

3.5 Explain with legible sketch the principle of operation of welding transformer with a reactance coil

3.6 Explain the different types of electrodes used for welding

3.7 Explain electronic circuits used for welding

3.8 Explain the `Sequence Weld' with a block diagram

4.0 Comprehend the Testing of Domestic Appliances

4.1 List the tools required for testing and repair of Domestic appliances

4.2 List the meters and testing equipment required .

4.3 For the following Domestic appliances:

i) Ceiling, table fan

ii) Wet grinder

iii) Mixies

iv) Room heaters

v) Electric oven

vi) Toaster

a).State the principle

b) Describe the construction

c).Draw the electrical wiring diagram

d) List the steps involved in dismantling and assembling.

e) Give the testing procedure

f) Identify the fault

g) carry the repair work.

Note : Suitable tests to be conducted on the above Electrical Domestic appliances are Open circuit, Short circuit, Earth fault and Leakage tests

5.0 Comprehend the Maintenance of Electrical Power devices

5.1 Give the preventive and periodical maintenance schedule of the following electrical power devices.

i) Batteries (Dry / Wet) ii) UPS / Inverters

iii) DC Motors iv) AC Motors

v) Motor starters (AC& DC) vi) Air conditioners
vii) Circuit breakers(SF6 ,air blast, minimum oil)
viii) Relays(distance, directional, impedance)
ix) Lightning arrester(thyrite type, valve type)

COURSE CONTENTS

1. Electric Lighting

Nature of light and its production, Terms and definitions plane and solid angle, luminous flux, Lumen, C.P. Illumination, brightness, polar curve, MHCP, MSCP, MHSCP, - types of lamps - Requirements of good lighting

different types of lamp fittings- laws of illumination- Terms and factors used in design of lighting schemes for indoor – problems

2. Heating

Advantages of electric heating - requirements of good heating material and materials generally employed, resistance heating - Principle and applications - Temperature control of resistance furnaces - Electric arc furnaces - direct and indirect types - applications - Induction heating core type and coreless type - Applications - Dielectric heating – principle and applications.

3.0 Welding

Types of welding - Principle and applications of Resistance welding - spot welding -seam welding - butt welding - Arc welding -Metal Arc welding- Carbon Arc welding - use of coated electrode power supply – Welding generator, welding transformer - welding control circuits. Sequence welding circuits

4.0 Testing of Electrical Domestic Appliances

Tools & meters required for testing and repair of Domestic appliances-Principle, construction & working with fault finding, dismantling,assembling and testing after repair of the Domestic appliances.

Note: Suitable tests to be conducted on the above Electrical Domestic appliances, such as continuity test , Open circuit, Short circuit, Earth fault and Leakage tests etc.

5.0 Maintenance of Electrical Power devices

Preventive and periodical maintenance schedule of the following electrical power devices. i.e Batteries (Dry / Wet), UPS / Inverters, DC & AC Motors, Motor starters (AC& DC), Air conditioners, Circuit breakers, Relays, Lightning arrester.

REFERENCE BOOKS

1. Electrical power by S.L. Uppal
2. Electrical Utilisation by Gupta
3. Utilisation of Electric Power by Openshaw Taylor
4. Utilisation of Electric energy by R.K. Gang
5. Art and Science of electric power by H. Partab
6. K.B.Bhatia Study of Electrical Appliances and, devices
   Khanna publication
7. B. L. Theraja Electrical Technology Vol I To IV
   S. Chand & Co., New Delhi
8. B. V. S. Rao Operation & Maintenance of Electrical Machines Vol - I
   Media Promoters &PublisherLtd. Mumbai
9. B. V. S. Rao Operation & Maintenance of Electrical Machines Vol - II
   Media Promoters &PublisherLtd.Mumb

ELECTRICAL CAD AND PLC

Subject Title ***: Electrical CAD and PLC LABORATORY***

Subject Code **: EE-507**

Periods/Week **: 03**

Periods/sem **: 45**

TIME SCHEDULE

OBJECTIVES

S. No.	Major Topics	No. of Periods
1.	Study the Auto cad screen, various tool bars menus	3
2.	Exercise on standard commands	3
3.	Exercise on 2D drawing commands	3
4	Exercise on modify 2D commands	3
5.	Exercise on dimensioning commands	3
6	Exercise on formatting commands	3
7	Exercise on Insert commands	3
8	Exercise on view commands	3
9.	Introduction to Electrical CAD and project management	3
10.	Creating symbols	3
11.	Exercises on electrical schematics	6
12.	Execution of various ladder diagrams	6
13.	Execution of ladder diagrams for PLC based model applications	3
		45

Upon completion of the practice the student shall be able to

1.0 Study the Auto cad screen components.

1.1 Study components in menu bar
1.2 Customise and arrange tool bar
1.3 Display the drawing created in the working area.
1.4 Study user coordinate system(UCS)
1.5 Increase or decrease layouts
1.6 Give the inputs in the command bar
1.7 Display name and purpose of the tools
1.8 Study cross hair to locate the cursor
1.9 Invoke the commands
1.10 Getting started with AutoCAD

2.0 **Practice Exercises on Standard commands**.

2.1 Create a new file by NEW command
2.2 Open a file by OPEN command
2.3 Save a file by SAVE command
2.4 Close a file by CLOSE command
2.5 Delete the object or text using CUT command
2.6 Copy the object or text using COPY command

2.7 Paste entities copied by using PASTE command
2.8 Zoom an object by using ZOOM command.

3.0 Practice exercise on 2D drawing commands

3.1 Draw a line using LINE command
3.2 Create a multiple parallel lines by using MLINE command
3.3 Create a poly line using POLYLINE command
3.4 Add arc segments to a poly line using ARC command
3.5 Draw a circle using CIRCLE command, with centre point and radius.
3.6 Draw a polygon using POLYGON command
3.7 Draw a helix using HELIX command
3.8 Draw a rectangular, Triangular and quadrilateral areas filled with a solid colour with the help of plane tool
3.9 Draw a smooth curve to a series of points using SPLINE command
3.10 Draw an elliptical curve using ELLIPSE command
3.11 Divide a object into specified segments using DIV command
3.12 Insert a block into the current drawing using INSERT command000
3.13 Fill an enclosed area or an object using HATCH command

4.0 **Practice Exercises on modifying 2D commands**

4.1 Create a mirror image of an entity using MIRROR command
4.2 Create multiple images of an entity using ARRAY command
4.3 Change the size of an object by using STRETCH command
4.4 Trim the edges of an object at the edges of another object using TRIM command
4.5 Break a line or an object between two points using BREAK command
4.6 Join two similar objects to form a single using JOINT command
4.7 Create a fillet round the edges of two arcs using FILLET command
4.8 Chamfer on lines which are crossed, radiating or unlimited long using CHAMFER command
4.9 Break a compound object into its component objects using EXPLODE command
4.10 Form a group of selected entities by using GROUP command

5.0 Practice Exercises on dimensioning commands.

5.1 Create and modify quickly a series of dimensions using QDIM command
5.2 Practice LINEAR ,ALIGNED ,and COORDINATE dimensions
5.3 Indicate radii and diameters of arcs and circles using RADIUS or DIAMETER commands
5.4 Measure angle between two lines using ANGLUR dimension command
5.5 Measure length of arc using ARC LENGTH command
5.6 Create a base line dimension from a specified baseline using BASELINE command
5.7 Mark a centre of an arc or circle using CENTREMARK command

6.0 Practice Exercises on formatting commands.

6.1 Create layers using LAYER command.
6.2 Control the visibility of objects and assigned properties to objects.
6.3 Practice the locking unlocking of layers.
6.4 Write a text to drawing, change font size and style.
6.5 Create a standard naming convention to a text styles, table styles, layer styles, dimension styles etc.

7.0 Practice Exercises on insert commands.

7.1 Insert blocks into current drawing file using INSERT command
7.2 Attach an image to a drawing image using ATTACH RASTER IMAGE command

7.3 Add an attribute to a drawing by defining it and save it by using DEFINE ATTRIBUTE

7.4 Define attribute by specifying the characteristics of the attribute, including its name, prompt and default values

8.0 Practice Exercises on view commands.

8.1 Redraw or refresh a display by using REDRAW command
8.2 Regenerate or reproduce the current viewports of all entities by using Regen command
8.3 Show the orthographic views (side view, top view, front view) of any object
8.4 Show the isometric views of any object
8.5 Shade a given object with solid colour using SHADE command
8.6 Create a hidden line view of a model using HIDE command
8.7 Create wire frame model using WIRE FRAME command

9.0 Introduction to Electrical CAD and project manager

9.1 Introduction to ELECTRICAL CAD interface
9.2 Electrical components and wires
9.3 Working with projects
9.4 Adding and Creating a new drawing
9.5 Inserting a component
9.6 Connecting a component

10.0 Creating Symbols

10.1 Creating a symbol builder
10.2 Creating a circuit builder
10.3 Save circuit to icon menu

11.0 Practice Exercises on Electrical drawings

11.1 Draw Electrical symbols
11.2 Draw core section of transformer
11.3 Draw electrical poles and towers
11.4 Draw pipe earthing with dimensions
11.5 Draw plate earthing with dimensions
11.6 Draw simple electronic circuits
11.7 Draw the views of electrical machines like DC and AC machines

12.0 Execution of various ladder diagrams

12.1 Identify the main components of the PLC module and configure the PLC drivers
12.2 Perform the simple ON/OFF control task through the PLC unit
12.3 Perform a relay switching logic task through a PLC unit
12.4 Develop a ladder logic program for AND,OR and NOT gates, download the program and run it
12.5 Develop a ladder logic program for NAND,NOR, EX-OR and EX-NOR gates PLC,download the program and run it
12.6 Execute the ladder diagrams for a the following Timer functions
   a) T-ON(ON-Delay Timer)
   b) T-OFF(OFF-Delay Timer)
   c) RTON(Retentive on)
12.7 Execute the ladder diagrams for a the following counter functions
   a) CTU(count-Up counter)
   b) CTD(count-down Counter)

13.0 Execution of Ladder diagrams for PLC based model applications

   a) Stair case lighting
   b) DOL starter

c) Star Delta starter

S No	Name of the experiment	Competencies	Key competencies
1.	Study the Auto cad screen, various tool bars menus	▪ Study the Auto cad screen components. ▪ Study components in menu bar ▪ Customise and arrange tool bar ▪ Study user coordinate system(UCS) ▪ Give the inputs in the command bar ▪ Invoke the commands	▪ Study the Auto cad screen components. ▪ Study components in menu bar ▪ Customise and arrange tool bar ▪ Study user coordinate system(UCS) ▪ Give the inputs in the command bar ▪ Invoke the commands
2.	Exercise on standard commands	▪ Create a new file by NEW command ▪ Open a file by OPEN command ▪ Save a file by SAVE command ▪ Close a file by CLOSE command ▪ Zoom an object by using ZOOM command.	▪ Study Menu Commands thoroughly
3.	Exercise on 2D drawing commands	▪ Draw a line using LINE command ▪ Add arc segments to a poly line using ARC command ▪ Draw a circle using CIRCLE command, with centre point and radius. ▪ With plane tool draw a rectangular, Triangular and quadrilateral areas filled with a solid colour. ▪ Draw a elliptical curve using ELLIPSE command ▪ Divide a object into specified segments using DIV command ▪ Insert a block into the current drawing using INSERT command ▪ Fill an enclosed area or an object using HATCH command	▪ Study 2D Draw Commands thoroughly
4	Exercise on modifying 2D commands	▪ Create a mirror image of an entity using MIRROR command ▪ Change the size of an object by using STRETCH command ▪ Trim the edges of an object at the edges of another object using TRIM command ▪ Break a line or an object between two points using BREAK command ▪ Join two similar objects to form a single using JOINT command ▪ Create a fillet round the edges of two arcs using FILLET command ▪ Chamfer on lines which are crossed, radiating or unlimited long using CHAMFER command	▪ Study Edit Commands thoroughly

		▪ Break a compound object into its component objects using EXPLODE command ▪ Form a group of selected entities by using GROUP command	

Competencies and key competencies to be achieved by the student

5	Exercise on dimensioning commands	▪ Create and modify quickly a series of dimensions using QDIM command ▪ Indicate radii and diameters of arcs and circles using RADIUS or DIAMETER commands ▪ Measure angle between two lines using ANGLUR dimension command ▪ Mark a centre of an arc or circle using CENTREMARK command	▪ Practice Dimension Commands Thoroughly
6	Exercise on formatting commands	▪ Create layers using LAYER command. ▪ Control the visibility of objects and assigned properties to objects. ▪ Write a text to drawing, change font size and style.	▪ Practice Formatting Commands Thoroughly
7	Exercise on insert commands	▪ Inserts blocks into current drawing file using INSERT command ▪ Define attribute by specifying the characteristics of the attribute, including its name, prompt and default values	▪ Practice Insert Commands Thoroughly
8	Exercise on view commands	▪ Show the orthographic views (side view, top view, front view) of any object ▪ Show the isometric views of any object ▪ Shade a given object with solid colour using SHADE command ▪ Create a hidden line view of a model using HIDE command ▪ Create wire frame model using WIRE FRAME command	▪ Practice View Commands Thoroughly
9	Introduction to Electrical CAD and Project manger	▪ Understand the Electrical CAD interface ▪ Accessing project files ▪ Add a drawing to the project file ▪ Project manager drawing list	▪ Access project files ▪ Open drawing ▪ Create drawing ▪ Add a drawing to a project file ▪ Managing a drawing in projects

10.	Creating symbols	▪ Creating a library symbol ▪ Creating a symbol builder ▪ Creating a circuit builder	▪ Practice throughly
11.	Exercise on Electrical drawings	▪ Draw electrical symbols ▪ Draw the views of electrical machines like dc and ac machines	▪ Practice Commands Thoroughly
12.	a) Demonstrate PLC and Ladder diagram b) Execute Ladder diagrams for different Logical Gates c) Execute Ladder diagrams using timers & counters	• Identify the PLC unit, the Personal Computer and Loaded PLC software • Observe the input and output terminals of the PLC • Configure the PLC drivers • Prepare the appropriate ladder diagrams for different logical gates(AND, OR, NOT, NOR,NAND) • Save the ladder diagram with relevant file names • Down load the program into the PLC • Run the program	• Rectify errors if any then save and again executing the program
13	Execute Ladder diagrams of PLC based working model applications (i) PLC based DOL starter (ii) PLC based Star-Delta Starter module (iii) PLC based Stair case lighting	• Identify the different available model application in the lab ▪ Draw the ladder diagrams for the DOL starter and star/delta starter • Enter the ladder logic program in the Computer ,saving and executing the program • Make proper connections of the model application at the output terminals of PLC and downloading its relevant LD program in PLC • Run the LD program and observing the outputs with the model applications • Execute the Ladder diagrams for other model application like “Stair case lighting	▪ Execute the LD programs and observe the performance of starters ▪ Design Ladder Logic for the stair case lighting ,

REFERENCES

1. An introduction to Auto CAD-Dayanithi (NITTTR)
2. CAD Software by 4M CAD,Intelly CAD

3. Auto CAD-S.Vishal.

4. Project Management Practice software: Open Project

5. PLC programming : Frank D Petruezuella

POWER ELECTRONICS LABORATORY

Subject Title : Power Electronics Laboratory

Subject Code : EE-508

Periods/Week : 03

Periods/Year : 45

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Characteristics of different Power Electronic Devices	10
2.	Study the working of different Power Electronic circuits	10
3.	Speed control of the DC motor using the Power Electronic Devices	10
4.	Speed control of the single phase motor using SCR, and Battery charging	15
	Total	45

LIST OF EXPERIMENTS

1. Characteristics of SCR

2. Characteristics of IGBT

3. Characteristics of DIAC

4. Characteristics of TRIAC

5. Characteristics of GTO

6. Study of Single – Phase Half and Fully controlled Bridge

7. Study of Single phase invertors using SCR's

8. D.C Motor speed control using Single phase Half converter

9. D.C Motor speed control using Single phase Full converter SCR Bridge

10. Control the speed of a given single phase motor using SCR

11. Speed control of DC Motor using Chopper

12. Study of DIAC & TRIAC Lamp control.

13. Battery charger circuit using SCR

S.No	Experiment title	competencies	Key competencies
1	Characteristics of i) SCR ii) IGBT and iii) GTO (6)	Identify the different Power electronic devices available in the laboratory like SCR, IGBT,GTO Draw the symbols of the above devices. Identify the different terminals. Draw the necessary circuit diagram and identify the apparatus required Make the connections of the circuit as per the circuit diagram of forward bias Record the different values of voltage and current in forward bias Change the connections of the circuit as per the circuit diagram of Reverse bias Record the different values of voltage and current in reverse bias	▪ Identify the different terminals ▪ Make the connections of the circuit as per the circuit diagram of forward bias ad reverse bias.

		Plot the forward and reverse characteristics on a graph sheet Repeat the experiment for IGBT, GTO and plot the V-I characteristics.	
2	i) Working of single phase half wave converter ii) working of single phase full wave converter (6)	Draw the circuit diagram for the single phase half wave converter Identify the different components and apparatus required for the circuit Make the necessary connections as per the circuit diagram with resistive load. Verify the waveforms in the CRO at different gate current pulses Change the R- load with R-L load and observe the waveforms at different gate current pulses Study the working of the single phase full wave converter with R load and R-L load in similar way as above Draw the circuit diagram for the single phase full wave converter using SCR's Identify the different components and apparatus required for the circuit Make the necessary connections as per the circuit diagram Verify the waveform in the CRO for different gate pulses	▪ Verify the waveforms in the CRO at different gate current pulses
	i) Speed	Draw the circuit diagram for the speed control of the DC motor using the single phase full wave convertor Identify the different apparatus required from the circuit diagram	▪ Change the triggering angles ▪ Change the duty cycle

3	Control of DC motor using single phase full converter ii) Speed Control of DC motor using Chopper. (6)	Make the necessary connections according to the circuit Change the triggering angles and Noting down the readings of the speed of the DC motor Plot the graph Speed Vs Triggering Angles Perform another experiment in similar way on speed control of the DC motor using a single phase chopper Change the duty cycle Note down the readings of the speed of the DC motor Plot the graph : Speed Vs Duty cycle	
4	Speed control of single phase AC motor using SCR. (3)	Draw the circuit diagram for the speed control of the single phase AC motor using the Silicon controlled Rectifier Identify the different apparatus required from the circuit Make the necessary connections according to the given circuit diagram Note down the readings of the speed of the DC motor by changing the triggering angles Draw the graph between Speed Vs Triggering Angles	▪ change the triggering angles ▪ Draw the graph between Speed Vs Triggering Angles

AC MACHINES – II LABORATORY

Subject Title : AC Machines - II Laboratory

Subject Code : EE-509

Periods/Week : 06

Periods/Year : 90

TIME SCHEDULE

S.No	MAJOR TOPICS	No Of Periods
1.	Tests on 1-phase and 3-phase AC Motors	18
2.	Drawing circle diagram on AC Motors	27
3.	Identify and rectify faults in AC motors	15
4	Identify and rectify faults in AC starters	15
5	Study of Government SSR rate contracts and preparation of estimation	15
	Total	90

OBJECTIVES

Upon completion of the practice the student shall be able to

Conduct brake test on 3-phase squirrel cage induction motor.

Conduct Brake test on 3-phase slip ring induction motor.

Perform Load test on Single phase split type induction motor.

Perform Load test on single phase capacitor type induction motor

Conduct suitable tests and draw circle diagram of squirrel cage induction motor.

Conduct suitable tests and draw circle diagram of slip ring induction motor

Conduct load test on synchronous motor and draw V and inverted V curves.

Identify and rectify faults in AC motors.

Identify and rectify faults in AC starters

Study of Government SSR rate contracts and preparation of estimation of a given building or load

Competencies & Key competencies to be achieved by the student

S.No	Experiment Title	Competencies	Key competency
		□ Draw the circuit diagram □□□Identify the different terminals of 3-ph induction motor □ Select the suitable starter. □□□Identify the terminals of the starter.	□ Apply the load up to full load in steps □ Pour water in the brake

1	Brake test on 3- phase squirrel cage induction motor.	□□□Select the range and type of the meters □ Make the connections as per the circuit diagram □ Start the motor using a starter Apply the load up to full load in steps □ Pour water in the brake drum □ Note down the readings of ammeter and voltmeter for each load. □□□Calculate the output, torque and efficiency etc □□□Plot the performance characteristics □□□Verify the performance of the machine.	drum □ Before Switching off the motor remove the load
2	Brake test on 3-phase slip ring induction motor.	□ Draw the circuit diagram □□□Interpret the name plate details □ Identify the different terminals of the 3-ph induction motor □ Select the suitable starter. □□□Identify the terminals of the starter. □□□Select the range and type of the meters	□ Before giving supply Slip rings must be short circuited □ Speed should be measured accurately
		▪ Start the motor using a starter ▪ Verify the performance of the machine.	
3,4	Load test on a)split phase induction motor. b) capacitor type induction motor	▪ Draw the circuit diagram ▪ Identify the different terminals of the 1-ph split phase induction motor /1-ph capacitor type induction motor and the starter ▪ Select the ranges and type of the meters ▪ Make the connections as per circuit diagram ▪ Start the motor using a starter ▪ Apply the load in steps ▪ Record the meter readings ▪ Verify the performance of the machine.	▪ Start the motor using a starter without load ▪ Apply the load up to full load in steps
5	Load test on single-phase Universal motor.	▪ Draw the circuit diagram ▪ Identify the different terminals of the 1-ph universal motor ▪ Select the range and type of the meters ▪ Make the connections as per the circuit diagram ▪ Start the motor using a starter ▪ Apply the brake load lightly ▪ Verify the performance of the machine	▪ Apply the brake load lightly ▪ Take the readings properly
6,7	Conduct suitable tests and draw circle diagram of a)squirrel cage induction motor b)slip ring induction motor	▪ Draw the circuit diagram for No-load test and Blocked rotor test ▪ Make the connections for no-load test and Blocked rotor test as per the circuit diagram ▪ Start the motor without load ▪ Apply the rated voltage to the motor in the no-load test and rated current to the blocked rotor test. ▪ During the Blocked rotor test fully tighten the rotor shaft ▪ Record the meter readings ▪ Calculate the output, torque ,efficiency etc. ▪ Plot the performance characteristics. ▪ Verify the performance of the machine. ▪ Draw the circle diagram on a graph sheet using	▪ Apply the rated voltage to the motor in the no-load test and rated current to the blocked rotor test. ▪ During the Blocked rotor test fully tighten the rotor

		the test data ▪ Select proper scale to draw the circle diagram	
8	Conduct load test on synchronous motor and draw V and inverted V curves	▪ Draw the circuit diagram ▪ Identify different terminals of the 3-ph synchronous motor ▪ Select the range and type of the meters ▪ Make the connections as per the circuit ▪ Start the motor as per the procedure ▪ Switch on the excitation at correct time ▪ Vary the excitation in steps ▪ Pour water in the brake drum for cooling. ▪ Reduce the load to zero gradually. ▪ Switch off the motor. ▪ Disconnect the circuit.	▪ Switch on the excitation at correct time ▪ Vary the excitation in steps ▪ First switch off the excitation and then only switch off mains
		▪ Calculate the output, torque ,efficiency etc. ▪ Plot the performance characteristics. ▪ First switch off the excitation and then only switch off the mains ▪ Draw the V and inverted V curves on a single graph sheet	
9	Identify and rectify faults in AC motors	▪ Select a faulty motor ▪ Identify the different terminals of ac motors. ▪ Interpret the name plate details. ▪ Identify the different parts of the motor Identify the problems in the motor by physical observation ▪ Verify all the connections of the motor and the starter ▪ Check for burnout fuses. ▪ Identify any loose connections if any to tighten the connections ▪ Check the condition of bearings. ▪ Check the continuity of different windings by using DMM or Test lamp. ▪ Identify any open or short circuits in the windings. ▪ Check the continuity between windings and body earthing. ▪ Start the motor using a starter without load. ▪ Observe whether the motor is running or not ▪ If running with normal speed no problem in the motor. ▪ If running with low speed check for reversal of phase and Reduce the load to Zero gradually ▪ Switch off the motor ▪ Disconnect the circuit.	▪ Identify the problems in motor by physical observation ▪ check for reversal of phase and Reduce the load to Zero gradually ,If the Motor is running with low speed
10	Identify and rectify faults in AC starters	▪ Check the input and output terminals of the starter ▪ Check the condition of contactors for opening and closing ▪ Check for open circuit and short circuit in the coils of contactor. ▪ Check the condition of over load relay coil and no volt coil ▪ Check the current setting dial for proper current setting	▪ Check the current setting dial for proper current setting

11		▪ Check the contactor opening and closing time. Study of Government SSR rate contracts and preparation of estimation	

PROJECT WORK

Subject Title	**:**	**Project Work**
Subject Code	**:**	**EE- 510**
Periods / Week	**:**	**03**
Periods / Semester	**:**	**45**

OBJECTIVES

Upon completion of the Project work the student shall be able to

Project work

Identify different works to be carried out in the Project.
Collect data relevant to the project work.
Carry out need survey.

Select the most efficient method from the available choices based on preliminary investigation.
Design the required elements of the project work as per standard practices.
Prepare the working modules / equipments required for the project work.

Estimate the cost of project, technological need, computer skills, materials and other equipments.
Prepare 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.
Prepare of critical activities at the various stages of the project work.
Test for various conditions with different electrical input parameter if required.

Implement the given project work and record the results at various places.

Collect necessary information to procure necessary finance, and equipment.
Prepare a chart or model for the project.
Preparation of project report.

Report on observations in Industrial visits

Visit nearby Traction Sub-station / Loco shed / any Sub-station above 133 KV and submit a report.

COURSE CONTENT

Project work is intended to provide training in the solution of various fields of engineering problems relating to

Rural Electrification Systems: Solar Lamps, Solar Cooker, Solar Water pumping systems etc.

Energy Saving Equipments: Replacing of Tungsten filament lamps with effective Implementation of LED, CFL Lamps at various applications.

Automobile Field: Solar Operated Vehicles, Battery Operated Vehicles, Remote Operated electrical Devices, Usage of advanced Tubular Batteries for improving the efficiency.

Energy Management Techniques: Energy auditing at various reputed Industries. **Electrical Power Systems:** Working Models of Hydel, Thermal and Non Conventional Power Generation Systems. Transmission and distribution system analysis.

Power Devices: Inverter, SCR based applications, UPS and Automatic switching DG Sets etc.

Electric traction : Metro-line projects .

Industrial Visit nearby Power Station

Project work will also include the 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 knowledge he/she acquired in the course and also which involves some extra study of reference materials.

Exercises:

Planning of a Electrical Power Distribution Lines inside the Institution premises.

Wirings of existing system.
Industrial complex wiring designs.

Rural electrification supply Scheme.

Energy efficient management systems.
Power Saving systems.

Design of Substations.

Set up of a small enterprise under self employment scheme.

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 which is 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