STATE COUNCIL OF TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA
TEACHING AND EVALUATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

DISCIPLINE: ELECTRICAL ENGINEERING						**SEMESTER: 3RD**						
SL NO	**SUBJECT CODE**	**SUBJECT**	**PERIODS**			**EVALUATION SCHEME**						
			L	**T**	**P**	**INTERNAL EXAM**			**END SEM EXAM**	**TERM WORK**	**PRACTICAL EXAM**	**TOTAL MARKS**
						TA	**CT**	**Total**				
THEORY												
1.	BST 301	ENGG.MATH - III	4	0	0	10	20	30	70			100
2.	ETT 321	ANALOG ELECTRONICS AND OPAMP	4	1	0	10	20	30	70			100
3.	EET 301	CIRCUIT AND NETWORK THEORY	4	1	0	10	20	30	70			100
4.	MET 321	ELEMENTS OF MECHANICAL ENGG	4	1	0	10	20	30	70			100
5.	EET 302	ELECTRICAL ENGG. MATERIAL	4	0	0	10	20	30	70			100
PRACTICAL/TERM WORK												
6.	MEP 321	MECHANICAL ENGINEERING LAB	0	0	6					50	50	100
7.	ETP 321	ANALOG ELECTRONICS LAB	0	0	6					25	50	75
8.	EEP 301	CIRCUIT THEORY LAB	0	0	4					25	50	75
GRAND TOTAL			**20**	**03**	**16**	**50**	**100**	**150**	**350**	**100**	**150**	**750**

Total Contact hours per week: 39
Abbreviations: L-Lecture, T-Tutorial, P-Practical, TA- Teacher's Assessment, CT- Class test
Minimum Pass Mark in each Theory Subject is 35% and in Practical subject is 50%

ENGINEERING MATHEMATICS – III

(COMMON TO ELECT/CSE/ETC, AE & I/CP/IT/MECH/AUTO)

Name of the Course: Diploma in Electrical Engineering			
Course code:	BST 301	Semester	3rd
Total Period:	60	Examination	3 hrs
Theory periods:	4P / week	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

A. RATIONALE:

The subject Engineering Mathematics-III, is a common paper for Engineering branches. This subject includes Matrices, Laplace Transforms, Fourier Series, Differential Equations and Numerical Methods etc. for solution of Engineering problems.

B. OBJECTIVE:

On completion of study of Engineering Mathematics-III, the students will be able to:

1. Apply matrices in Engineering mechanics, electrical circuits and linear programming.
2. Transform Engineering problems to mathematical models with the help of differential equations and familiarize with the methods of solving by analytical methods, transform method, operator method and numerical methods.
3. Solve algebraic and transcendental equations by Iterative methods easily programmable in computers.
4. Analysis data and develop interpolating polynomials through method of differences.

C. Topic wise distribution of periods:

Sl. No.	Topics	Period
1	Matrices	04
2	Differential equation	12
3	Laplace transform	14
4	Fourier series	14
5	Numerical methods	04
6	Finite difference & Interpolation	12
	Total:	**60**

D. COURSE CONTENTS

1. MATRICES 04

1.1 Define rank of a matrix.

1.2 Perform elementary row transformation to determine the rank of a matrix.

1.3 State Rouche's Theorem for consistency of a system of linear equations in 'n' unknowns.

1.4 Solve equations in three unknowns testing consistency.

2. Linear Differential Equations 12

2.1 Define Homogeneous and non-homogeneous differential equations with constant coefficients with examples.

2.2 Find general solution of linear equations in terms of C.F. and P.I.

2.3 Derive rules of finding C.F. and P.I. in terms of operator D.

2.4 Define Partial Differential equations(P.D.E.)

2.5 Form partial differential equations by eliminating arbitrary constants and arbitrary functions.

2.6 Solve partial differential equations of the form P.p+Q.q=R

2.7 Solve Engineering problems on 2.1-2.6.

3. LAPLACE TRANSFORMS **14**

3.1 Define Gamma function and $\Gamma(n+1)=n!$ and find $\Gamma(1/2)=\sqrt{\pi}$ (No problem)

3.2 Define Laplace transform of a function f(t) and inverse laplace transform.

3.3 Derive L.T. of standard functions and explain existence conditions of L.T.

3.4 Explain linear, shifting and Change of scale property of L.T.

3.5 Formulate L.T. of derivatives, integrals, multiplication by t^n and division by t.

3.6 Derive formula of inverse L.T.

3.7 Solve Linear Differential Equations with constant coefficients associated with initial conditions using Transform Method(upto 2^{nd} order only).

3.8 Solve problems on 3.2- 3.7

4 FOURIER SERIES **14**

4.1 Define periodic functions

4.2 State Dirichlet's conditions for the Fourier expansion of a function and its convergence.

4.3 Express periodic function $f(x)$ satisfying Dirichlet's conditions as a Fourier series.

4.4 State Euler's formulae.

4.5 Define Even and Odd functions and Obtain F.S. in $(0 \le x \le 2\pi$ and $-\pi \le x \le \pi)$

4.6 Obtain F.S. of continuous functions and functions having points of discontinuity in $(0 \le x \le 2\pi$ and $-\pi \le x \le \pi)$.

4.7 Solve problems on 4.1-4.6

5 NUMERICAL METHODS **04**

5.1 Appraise limitations of analytic method of solution of algebraic and transcendental equations.

5.2 Derive Iterative formula for finding the solutions of algebraic and transcendental equations by:

a) Bisection method

b) Newton Raphson method

5.3 Solve problems on 5.2

6 FINITE DIFFERENCE and INTERPOLATION 12

6.1 Explain finite difference and form table of forward and backward difference.

6.2 Define shift operator(E) and establish relation between E and difference operator(Δ).

6.3 Derive Newton's forward and backward interpolation formula for equal interval.

6.4 State Lagrange's Interpolation formula for unequal intervals.

6.5 Explain numerical integration and state

6.5.1 Newton-Cote's formula(No derivation)

6.5.2 Trapezoidal Rule

6.5.3 Simpson's $1/3^{rd}$ rule

6.6 Solve Problems on 6.1-6.5

Learning Resources:

Sl.No	Name of Authors	Title of the Book	Name of Publisher
Text Book:			
1	Dr.B.S. Grewal	Higher Engineering Mathematics	Khanna Publishers

Reference Book

1 Text book of Engineering Mathematics-III By C.R.Mallick Kalyani Publication

Analog Electronics and OP-AMP

Name of the Course: Diploma in Electrical Engineering			
Course code:	ETT 321	Semester	3rd
Total Period:	60L	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:		Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

A. Rationale:

Electrical Engineers use electronic devices and circuits in various fields. The modern electrical plants need help of solid state electronic circuits for control, starting etc. So it was felt to provide a subject having electronic devices and circuits for the electrical students. Study of practical circuits and components have been dealt here with in the theoretical approach.

B. Objectives:

1. To develop knowledge on the characteristics of different types of diodes, transistors, UJT, FET and to draw a comparison in their characteristics and application.
2. To develop knowledge of their application.
3. To develop knowledge of different oscillator circuits and to identify the difference between them and their frequency relation.
4. To develop knowledge of operational amplifiers and their application in the field.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl No.	Name of the Topic	Periods
1	P-N JUNCTION DIODE	6
2	SPECIAL SEMICONDUCTOR DEVICES	5
3	RECTIFIER CIRCUITS & FILTERS	7
4	TRANSISTORS	7
5	TRANSISTOR CIRCUITS	7
6	TRANSISTOR AMPLIFIERS & OSCILLATORS	13
7	FIELD EFFECT TRANSISTOR	6
8	OPERATIONAL AMPLIFIERS	9
	Total	**60**

D. Course Content:

1. P-N JUNCTION DIODE: **6 P**
   - 1 . 1 P-N Junction Diode
   - 1 . 2 Working of Diode
   - 1 . 3 V-I characteristic of PN junction Diode.
   - 1 . 4 DC load line
   - 1 . 5 Important terms such as Ideal Diode, Knee voltage
   - 1 . 6 Junctions break down.
     - 1.6.1 Zener breakdown
     - 1.6.2 Avalanche breakdown
   - 1 . 7 P-N Diode clipping Circuit.
   - 1 . 8 P-N Diode clamping Circuit

2. **SPECIAL SEMICONDUCTOR DEVICES:** **5 P**
   - 2 . 1 Thermistors, Sensors & barretters
   - 2 . 2 Zener Diode
   - 2 . 3 Tunnel Diode
   - 2 . 4 PIN Diode

3. **RECTIFIER CIRCUITS & FILTERS:** **7 P**
   - 3.1 Classification of rectifiers
   - 3.2 Analysis of half wave, full wave centre tapped and Bridge rectifiers and calculate:
     - 3.2.1 DC output current and voltage
     - 3.2.2 RMS output current and voltage
     - 3.2.3 Rectifier efficiency
     - 3.2.4 Ripple factor
     - 3.2.5 Regulation
     - 3.2.6 Transformer utilization factor
     - 3.2.7 Peak inverse voltage
   - 3.3 Filters:
     - 3.3.1 Shunt capacitor filter
     - 3.3.2 Choke input filter
     - 3.3.3 π filter

4. **TRANSISTORS:** **7 P**
   - 4.1 Principle of Bipolar junction transistor
   - 4.2 Different modes of operation of transistor
   - 4.3 Current components in a transistor
   - 4.4 Transistor as an amplifier

4.5 Transistor circuit configuration & its characteristics

4.5.1 CB Configuration

4.5.2 CE Configuration

4.5.3 CC Configuration

5. **TRANSISTOR CIRCUITS:** **7 P**

5.1 Transistor biasing

5.2 Stabilization

5.3 Stability factor

5.4 Different method of Transistors Biasing

5.4.1 Base resistor method

5.4.2 Collector to base bias

5.4.3 Self bias or voltage divider method

6. **TRANSISTOR AMPLIFIERS & OSCILLATORS:** **13 P**

6.1 Practical circuit of transistor amplifier

6.2 DC load line and DC equivalent circuit

6.3 AC load line and AC equivalent circuit

6.4 Calculation of gain

6.5 Phase reversal

6.6 H-parameters of transistors

6.7 Simplified H-parameters of transistors

6.8 Generalised approximate model

6.9 Analysis of CB, CE, CC amplifier using generalised approximate model

6.10 Multi stage transistor amplifier

6.10.1 R.C. coupled amplifier

6.10.2 Transformer coupled amplifier

6.11 Feed back in amplifier

6.11.1 General theory of feed back

6.11.2 Negative feedback circuit

6.11.3 Advantage of negative feed back

6.12 Power amplifier and its classification

6.12.1 Difference between voltage amplifier and power amplifier

6.12.2 Transformer coupled class A power amplifier

6.12.3 Class A push – pull amplifier

6.12.4 Class B push – pull amplifier

6.13 Oscillators

6.13.1 Types of oscillators

6.13.2 Essentials of transistor oscillator

6.13.3 Principle of operation of tuned collector, Hartley, colpitt, phase shift, wein-bridge oscillator (no mathematical derivations)

7. **FIELD EFFECT TRANSISTOR:** **6 P**

- 7.1 Classification of FET
- 7.2 Advantages of FET over BJT
- 7.3 Principle of operation of BJT
- 7.4 FET parameters (no mathematical derivation)
  - 7.4.1 DC drain resistance
  - 7.4.2 AC drain resistance
  - 7.4.3 Trans-conductance
- 7.5 Biasing of FET

8. **OPERATIONAL AMPLIFIERS:** **9P**

- 8.1 General circuit simple of OP-AMP and IC – CA – 741 OP AMP
- 8.2 Operational amplifier stages
- 8.3 Equivalent circuit of operational amplifier
- 8.4 Open loop OP-AMP configuration
- 8.5 OPAMP with fed back
- 8.6 Inverting OP-AMP
- 8.7 Non inverting OP-AMP
- 8.8 Voltage follower & buffer
- 8.9 Differential amplifier
  - 8.9.1 Adder or summing amplifier
  - 8.9.2 Sub tractor
  - 8.9.3 Integrator
  - 8.9.4 Differentiator
  - 8.9.5 Comparator

Learning Resources:

Sl.No	**Name of Authors**	**Title of the Book**	**Name of the publisher**
1	Sanjeev Gupta	Electronic Devices and Circuits	Dhanpat Rai Publications

Circuit and Network Theory

Name of the Course: Diploma in Electrical Engineering			
Course code:	EET 301	Semester	3rd
Total Period:	75(60L+15T)	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:	1P/week	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

A. Rationale:

Study of Magnetic and Electric Circuits are essential in study of Electrical Engineering, study of Circuits and Network constitutes the basic and fundamental aspect of deriving insight into the functioning and analysis of Electrical network, instruments and machineries.

B. Objectives:

1. To develop the concept on Electrical circuit parameters and laws
2. To develop problem solving ability on magnetic Circuit.
3. To develop knowledge on network analysis
4. Use of theorems in problem solving.
5. To develop knowledge on R-L, R-C and R-L-C circuit analysis in A.C
6. To understand the behavior of circuit in transient condition.
7. To develop concept on network functions and parameters.
8. To develop knowledge of filters and their circuit characteristics

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Name of the Topic	Period
1	CIRCUIT ELEMENTS AND LAWS	04
2	MAGNETIC CIRCUITS	06
3	NETWORK ANALYSIS	04

4	NETWORK THEOREMS	08
5	AC CIRCUIT AND RESONANCE	10
6	COUPLED CIRCUITS	06
7	TRANSIENTS	08
8	TWO-PORT NETWORK	08
9	FILTERS	06
	TOTAL	**60**

D. COURSE CONTENT:

1. **CIRCUIT ELEMENTS AND LAWS:** 04
   - 1.1 Voltage, current, power and energy
   - 1.2 Resistance, Inductance & capacitance as parameters
   - 1.3 Active, Passive, Unilateral & bilateral, Linear & Non linear elements
   - 1.4 KVL and KCL, Voltage division & current division.
2. **MAGNETIC CIRCUITS** 06
   - 2 . 1 Introduction
   - 2 . 2 Magnetizing force, Intensity, MMF, flux and their relations
   - 2 . 3 Permeability, reluctance and permeance
   - 2 . 4 Analogy between electric and Magnetic Circuits
   - 2 . 5 B-H Curve
   - 2 . 6 Series & parallel magnetic circuit
   - 2 . 7 Hysteresis loop
3. **NETWORK ANALYSIS:** 04
   - 3.1 Mesh Analysis
   - 3.2 Mesh Equations by inspection
     - 3.2.1 Super mesh Analysis
     - 3.2.2 Nodal Analysis
     - 3.2.3 Nodal Equations by inspection
     - 3.2.4 Super node Analysis
   - 3.3 Source Transformation Technique
4. **NETWORK THEOREMS:** 08
   - **4.1** Star – delta transformation
   - 4.2 Super position Theorem
   - 4.3 Thevenin’s Theorem
   - 4.4 Norton’s Theorem
   - 4.5 Reciprocity Theorem
   - 4.6 Compensation Theorem
   - 4.7 Maximum power Transfer theorem

4.8 Milliman's Theorem

5. **AC CIRCUIT AND RESONANCE:** 10
   - 5.1 Review of A.C. through R-L, R-C & R-L-C Circuit
   - 5.2 Solution of problems of A.C. through R-L, R-C & R-L-C series Circuit by complex algebra method.
   - 5.3 Solution of problems of A.C. through R-L, R-C & R-L-C parallel &Composite Circuits
   - 5.4 Power factor & power triangle.
   - 5.5 Deduce expression for active, reactive, apparent power.
   - 5.6 Series resonance & band width in RLC Circuit
   - 5.7 Resonant frequency for a tank circuit
   - 5.8 Q factor & selectivity in series circuit.
   - 5.9 Poly phase Circuit
   - 5.10 Voltage, current & power in star & delta connection
   - 5.11 Three phase balanced circuit

6. **COUPLED CIRCUITS:** 06
   - 6.1 Self Inductance and Mutual Inductance
   - 6.2 Conductively coupled circuit and mutual impedance
   - 6.3 Dot convention
   - 6.4 Coefficient of coupling
   - 6.5 Series and parallel connection of coupled inductors

7. **TRANSIENTS:** 08
   - 7.1 Steady state & transient state response.
   - 7.2 Response to R-L, R-C & RLC circuit under DC condition.
   - 7.3 Application of Laplace transform for solution of D.C transient circuits.

8. **TWO-PORT NETWORK:** 08
   - 8.1 Open circuit impedance (z) parameters
   - 8.2 Short circuit admittance (y) parameters
   - 8.3 Transmission (ABCD) parameters
   - 8.4 Hybrid (h) parameters.
   - 8.5 Inter relationships of different parameters.
   - 8.6 T and π representation.

9. **FILTERS:** 06
   - 9.1 Classification of filters.
   - 9.2 Filter networks.
   - 9.3 Equations of filter networks.
   - 9.4 Classification of pass Band, stop Band and cut-off frequency.

9.5 Characteristic impedance in the pass and stop bands
9.6 Constant – K low pass filter
9.7 Constant – K high pass filter
9.8 Constant – K Band pass filter
9.9 Constant – K Band elimination filler
9.10 m- derived T section filter

Learning Resources:

Text Books			
Sl.No	**Name of Authors**	**Title of the Book**	**Name of the publisher**
1	A. Sudhakar & Shyam Mohan S Palli	CIRCUIT & NETWORKS for modules:- 1,3,4,5,6,7,8,9	Tata McGraw Hill
2	B. L. Thereja	Electrical Technology Volume – I [for module: 2 only]	S. Chand
3	Sakhija & Nagsarkar	Circuit and Networks [For modules:- 1,3,4,5,7,8 and 9.]	

Elements of Mechanical Engineering

Name of the Course: Diploma in Electrical Engineering			
Course code:	MET 321	Semester	4th
Total Period:	75(60L+15T)	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:	1P/week	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

A. Rationale:

This subject has been introduced with a view to provide adequate understanding of properties of steam, thermodynamic laws, Boilers, Turbines, Condensers to the students of electrical engineering since these form the basic and fundamental aspect for drive mechanisms used in generation of electricity

B. Objectives:

On completion of the course content the students will be able to:

1. Explain the principle of working of Boilers, Turbines and condensers.
2. State the different types of boilers and Turbines and their uses.
3. Explain the properties of steam.
4. State and explain thermodynamic laws.

C. TOPIC WISE DISTRIBUTION OF PERIODS

Sl No.	Topic	Periods
1.	THERMODYNAICS	06
2.	PROPERTIES OF STEAM	05
3.	BOILERS	10
4.	STEAM ENGINES	10
5.	STEAM TURBINES	06
6.	CONDENSER	04
7.	I.C. ENGINE	04
8.	HYDROSTATICS	05
9.	HYDROKINETICS	05
10.	HYDRAULIC DEVICES AND PNEUMATICS	05
	TOTAL	**60**

D. **Course Content :**

Chapters

1. THERMODYNAICS: 06
   - 1 . 1 State Unit of Heat and work, 1st law of thermodynamics.
   - 1 . 2 State Laws of perfect gases
   - 1 . 3 Determine relationship of specific heat of gases at constant volume and constant pressure.
2. PROPERTIES OF STEAM: 05
   - 2.1 Use steam table for solution of simple problem
   - 2.2 Explain total heat of wet, dry and super heated steam
3. BOILERS: 10
   - 3 . 1 State types of Boilers
   - 3 . 2 Describe Cochran, Babcock Wilcox boiler
   - 3 . 3 Describe Mountings and accessories
4. STEAM ENGINES: 10
   - 4.1 Explain the principle of Simple steam engine
   - 4.2 Draw Indicator diagram
   - 4.3 Calculate Mean effective pressure, IHP and BHP and mechanical efficiency.
   - 4.4 Solve Simple problem.
5. STEAM TURBINES: 06
   - 5.1 State Types
   - 5.2 Differentiate between impulse and reaction Turbine
6. CONDENSER: 04
   - 6.1 Explain the function of condenser
   - 6.2 State their types
7. I.C. ENGINE: 04
   - 7.1 Explain working of two stroke and 4 stroke petrol and Diesel engines.
   - 7.2 Differentiate between them
8. HYDROSTATICS: 05
   - 8.1 Describe properties of fluid
   - 8.2 Determine pressure at a point, pressure measuring Instruments
9. HYDROKINETICS: 05
   - 9.1 Deduce equation of continuity of flow
   - 9.2 Explain energy of flowing liquid
   - 9.3 State and explain Bernoulli's theorem
10. HYDRAULIC DEVICES AND PNEUMATICS: 05
    - 10.1 Intensifier
    - 10.2 Hydraulic lift
    - 10.3 Accumulator
    - 10.4 Hydraulic ram

Learning Resources:			
Text Books			
Sl.No	**Name of Authors**	**Title of the Book**	**Name of the publisher**

1	R. S. Khurmi	Thermal Engineering	
2	A. R. Basu	Hydraulics & Hydraulic M/Cs	
Reference Books:			
1	A. S. Sarad	Thermal Engineering	
2	R. K. Bansal	Hydraulics & Hydraulic M/Cs	

Electrical Engineering Material

Name of the Course: Diploma in Electrical Engineering			
Course code:	EET 302	Semester	3rd
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:	0	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

A. Rationale:

Electrical Engg. Materials hold prime importance for Electrical Engineers in design, installation & maintenance of electrical equipments. With the advent of latest metallurgical processes the materials used in the design processes brings safer and hazard free electrical installations. Hence basic knowledge on electrical Engineering materials is essential.

B. Objectives:

1. To clarify the students on insulating, conducting & magnetic materials.
2. To impart knowledge on the Physical, Electrical & Mechanical properties
3. To impart knowledge on practical uses of various materials in different areas.

C.TOPIC WISE DISTRIBUTION OF PERIODS

Sl No.	Topic	Periods
1.	Conducting materials	16
2.	Semiconducting materials	10
3.	Insulating materials	09
4.	Dielectric materials	08
5.	Magnetic materials	08
6.		

	Material for special purposes	09
	Total:	60

D.COURSE CONTENT:

1. **Conducting Materials:** 16

1 . 1 Introduction
1 . 2 Resistivity, factors affecting resistivity
1 . 3 Classification of conducting materials into low-resistivity and high resistivity materials
1 . 4 Low Resistivity Materials and their Applications
- 1 . 4.1 Copper
- 1 . 4.2 Silver
- 1 . 4.3 Gold
- 1 . 4.4 Aluminum
- 1 . 4.5 Steel

1 . 5 Stranded conductors
1 . 6 Bundled conductors
1 . 7 Low resistivity copper alloys
1 . 8 High Resistivity Materials and their Applications
- 1.8.1. Tungsten
- 1.8.2 Carbon
- 1.8.3 Platinum
- 1.8.4 Mercury

1 . 9 Superconductivity
1 . 10 Superconducting materials
1 . 11 Application of superconductor materials

2. **Semiconducting Materials:** 10

2 . 1 Introduction
2 . 2 Semiconductors
2 . 3 Electron Energy and Energy Band Theory
2 . 4 Excitation of Atoms
2 . 5 Insulators, Semiconductors and Conductors
2 . 6 Semiconductor Materials
2 . 7 Covalent Bonds
2 . 8 Intrinsic Semiconductors
2 . 9 Extrinsic Semiconductors
2 . 10 N-Type Materials
2 . 11 P-Type Materials
2 . 12 Minority and Majority Carriers
2 . 13 Semi-Conductor Materials

2 . 14 Applications of Semiconductor materials

2.14.1 Rectifiers

2.14.2 Temperature-sensitive resisters or thermistors

2.14.3 Photoconductive cells

2.14.4 Photovoltaic cells

2.14.5 Varisters

2.14.6 Transistors

2.14.7 Hall effect generators

2.14.8 Solar power

3. **Insulating Materials:** 09

3 . 1 Introduction

3 . 2 General properties of Insulating Materials

3.2.1 Electrical properties

3.2.2 Visual properties

3.2.3 Mechanical properties

3.2.4 Thermal properties

3.2.5 Chemical properties

3.2.6 Ageing

3.3 Insulating Materials – Classification, properties, applications

3.3.1 Introduction

3.3.2 Classification of insulating materials on the basis physical and chemical structure

3.4 Insulating Gases

3.4.1 Introduction

3.4.2 Commonly used insulating gases

4. **Dielectric Materials:** 08

4.1 Introduction

4.2 Dielectric Constant of Permittivity

4.3 Polarisation

4.4 Dielectric Loss

4.5 Electric Conductivity of Dielectrics and their Break Down

4.6 Properties of Dielectrics

4.7 Applications of Dielectrics

5. **Magnetic Materials:** 08

5.1 Introduction

5.2 Classification

5.2.1 Diamagnetism
5.2.2 Para magnetism
5.2.3 Ferromagnetism
5.3 Magnetization Curve
5.4 Hysteresis
5.5 Eddy Currents
5.6 Curie Point
5.7 Magneto-striction
5.8 Soft and Hard magnetic Materials
5.8.1 Soft magnetic materials
5.8.2 Hard magnetic materials

6. **Materials for Special Purposes** 09

6.1 Introduction
6.2 Structural Materials
6.3 Protective Materials
6.3.1 Lead
6.3.2 Steel tapes, wires and strips
6.4 Other Materials
6.4.1 Thermocouple materials
6.4.2 Bimetals
6.4.3 Soldering Materials
6.4.4 Fuse and Fuse materials
6.4.5 Dehydrating material

Learning Resources:

Text Books

Sl.No	Name of Authors	Title of the Book	Name of Publisher
1	K.B.Raina,S.K. Bhattacharya, T. Joneja	Electrical Engg. Material & Electronic components	S. K. Kataria & Sons
2	R.K.Shukla, Archana Singh	Electrical Engineering Materials	Mc Graw Hill

PR-I: MECHANICAL ENGG. LABORATORY

Name of the Course: Diploma in Electrical Engineering			
Course code:	MEP 321	Semester	3rd
Total Period:	90	Examination	4 hrs
Lab. periods:	6 P / week	Term Work	50
Maximum marks:	100	End Semester Examination:	50

1. APPLIED MECHANICS & MATERIAL TESTING

1.1 Determination of M.A.,V.R. and efficiency of Screw Jack

1.2 Determination of friction co-efficient of bearing

1.3 Determination of Young's modulus by Searle's Apparatus

1.4 Determination of M.A.,V.R. and efficiency of wheel train

1.5 Determination of Bending stress in beam using strain gauge

1.6 Study of Universal Testing Machine and determination of tensile stress and Young's module of M.S specification.

2. HYDRAULICS & HYDRAULIC MACHINE LAB

2.1 Study of pressure measuring devices such as (a) Piezo-meter (b) Simple manometer

2.2 Study of venturi-meter

2.3 Verification of Bernouli's Theorem

2.4 Model study of Centrifugal pumps, Francis, Turbine, Kaplan turbine and Pelton wheel.

3. HEAT ENGINE LAB

3.1 Study of Cochran Boiler

3.2 Study and demonstration of Stream Engine

3.3 Study and demonstration of Diesel Engine

3.4 Study and demonstration of Petrol Engine

PR2: ANALOG ELECTRONICS LAB

Name of the Course: Diploma in Electrical Engineering			
Course code:	ETP 321	Semester	3rd
Total Period:	90	Examination	4 hrs
Lab. periods:	6 P / week	Term Work	25
Maximum marks:	75	End Semester Examination:	50

A. RATIONALE

In this practical work the students get knowledge about the Analog Systems components. They will become capable of developing and implementing Analog Circuit.

B. OBJECTIVE

On completion of the Lab. Course the student will be able to

1. Identify the active components
2. Understand the behavior character of basic semiconductor devices
3. Understand the concept of oscillator. Amplifier, Rectifier etc.

C. COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES

1. Determine the input and output Characteristics of CE & CB transistor configuration
2. Determine Drain & Transfer Characteristics of JFET
3. Construct Bridge Rectifier using different filter circuit and to determine Ripple factor & analyze wave form with filter & without filter.
4. Construct Bridge Rectifier using different filter and to determine Ripple factor.
5. Construct & test the regulator using Zener diode

6. Construct different types of biasing circuit and analyze the wave form

   (i) Fixed bias (ii) Emitter bias (iii) Voltage divider bias

7. Study the single stage CE amplifier & find Gain

8. Study multi stage R-C coupled amplifier & to determine frequency- response & gain.

9. Construct & Find the gain

   (I) Class A. Amplifier (ii) Class B. Amplifier (iii) Class C Tuned Amplifier

10. Construct & test push pull amplifier & observer the wave form

11. Construct & calculate the frequency of

    (i) Hartly Oscillator (ii) Collpit's Oscillator (iii) Wein Bridge Oscillator (iv) R-C phase shift oscillator and draw wave form & calculate the frequency

12. Construct & Test Differentiator and Integrator using R-C Circuit

13. Study Multivibrator (Astable, Bistable, Monstable) Circuit & Draw its Wave forms

- **Mini Project:** To collect data like base configuration. Operational Characteristics, applications and critical factor etc. On all semiconductor devices studied in theory and compile a Project report throughout and submit at the end of the semester. To assemble and test simple circuit using above components with test Points.(e.g. Series Regulator / Oscillators etc)

Learning Resources:

Basic electronic Lab. Manual : Paul B. Zbar

PR 3: CIRCUIT THEORY LAB

Name of the Course: Diploma in Electrical Engineering			
Course code:	EEP 301	Semester	3rd
Total Period:	60	Examination	4 hrs
Lab. periods:	4 P / week	Term Work	25
Maximum marks:	75	End Semester Examination:	50

A. Rationale:

The response of Electrical Circuit can be verified practically by applying different theorems and fundamental techniques. The students will become sure that the theoretical tricks which they have learned from books are true. The students will become competent in the field of circuit analysis

B. Objective:

On completion of the lab course the student will be able to:

1. Verify the theorems using circuit theorems
2. Know the various types of filters
3. Know to draw different circuits using P-Spice software

C. Course content in terms of specific objectives:

1. Verification of KCL and KVL.
2. Verification of Super position theorem
3. Verification of Thieving's Theorem
4. Verification of Norton's Theorem
5. Verification of Milliman's Theorem
6. Verification of Maximum power transfer Theorem
7. Determine resonant frequency of series R-L-C circuit

8. Study of High pass filter & determination of cut-off frequency
9. Study of low pass filter & determination of cut-off frequency
10. Study of Band pass filter and Band Elimination filter & determination of its cut-off Frequency
11. Analyze the charging and discharging of an R-C & R-L circuit with oscilloscope and Compute the time constant from the tabulated data and determine the rise time graphically.
12. Determination of parameters of 'Two port Network'.
