TEACHING & EVALUATION SCHEME (2010 - 2011)

DISCIPLINE: ELECTRICAL ENGINEERING **SEMESTER: THIRD**

SL. NO	Subject	Teaching Scheme			Evaluation Scheme					Total Marks
					Theory			Practical		
					End	Internal Assesment		End		
	Theory	L	T	P	Exam	Class Test	Assignment	Exam	Sessional	
1	Analog Electronics & OP-AMP	4	1	0	80	15	5			100
2	Circuit & Network Theory	4	1	0	80	15	5			100
3	Principles of Mechanical Engineering	4	1	0	80	15	5			100
4	Electrical Engineering material	4	0	0	80	15	5			100
5	Mathematics-III	4	1	0	80	15	5			100
	Practical									
1	Mechanical Engineering Lab.	0	0	6				75	25	100
2	Electronics Lab.	0	0	6				75	25	100
3	Circuit Lab	0	0	3				25	25	50
	Grand Total	**20**	**4**	**15**						**750**

Analog Electronics and OP-AMP

Total Period : 75(60L + 15T) | **Exam – 3 Hrs**
Periods: (5 p/weak) | **Total Marks – 100**
Theory – 80
IA - 20

A. Rationale:

Electrical Engineering in various filed makes use of electronic devices and circuits. The modern electrical plants take help of electronic circuits for control, starting etc. And as such the solid state devices are found in use. So it was felt to provide a subject having electronic devices are found in use. So it was felt to provide a subject having electronic devices and circuits for the electrical students. A study of practical circuits and components here in have been dealt 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

TOPIC WISE DISTRIBUTION OF PERIODS

Sl No.	Topic	Periods
1.	P-N JUNCTION DIODE	06
2.	SPECIAL SEMICONDUCTOR DEVICES	05
3.	RECTIFIER CIRCUITS & FILTERS	07
4.	TRANSISTORS	07
5.	TRANSISTOR CIRCUITS	07
6.	TRANSISTOR AMPLIFIERS & OSCILLATORS	13
7.	FIELD EFFECT TRANSISTOR	06
8.	OPERATIONAL AMPLIFIERS	09
	Total:	**60**

Analog Electronics and OP-AMP

Chapters:

1. P-N JUNCTION DIODE:

- 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 Idal Diode, Knee voltage
- 1.6 Junction break down.
  - 1.6.1 Zener breakdown
  - 1.6.2 Avalance breakdown
- 1.7 P-N Diode clipping Circuit.
- 1.8 P-N Diode clamping Circuit

2. SPECIAL SEMICONDUCTOR DEVICES:

- 2.1 Thermistors , Sensors & barretters
- 2.2 Zener Diode
- 2.3 Tunnel Diode
- 2.4 PIN Diode

3. RECTIFIER CIRCUITS & FILTERS:

- 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:

- 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:

5.1 Transistor biasing
5.2 Stabilisation
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:

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 feed back 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:

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 Transconductance

7.5 Biasing of FET

8. OPERATIONAL AMPLIFIERS:

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

8.10 Adder or summing amplifier

8.11 Sub tractor

8.12 Integrator

8.13 Differentiator

8.14 Comparator

TEXT: 1. Electronic Devices and Circuits. By: Sanjeev Gupta
Publisher: Dhanpat Rai Publications

Circuit and Network Theory

Total Period : 75(60L + 15T) | **Exam – 3 Hrs**
Periods: (5 p/weak) | **Total Marks – 100**
Theory – 80
IA - 20

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

TOPIC WISE DISTRIBUTION OF PERIODS

Sl No.	Topic	Periods
1.	CIRCUIT ELEMENTS AND LAWS	06
2.	MAGNETIC CIRCUITS	04
3.	NETWORK ANALYSIS	03
4.	NETWORK THEOREMS	07
5.	AC CIRCUIT AND RESONANCE	08
6.	COUPLED CIRCUITS	10
7.	TRANSIENTS (DC & AC)	08
8.	TWO-PORT NETWORK	08
9.	FILTERS	06
	Total:	**60**

1. CIRCUIT ELEMENTS AND LAWS:

1.1 Voltage, current, power and energy

1.2. Resistance, Inductance & capacitance as parameters

1.3 Active, Passive, Bilateral & Unilateral, Linear & Non linear elements

1.4 KVL and KCL, Voltage division & current division.

2. MAGNETIC CIRCUITS (Refer – Electrical Technology Volume-I, by B. L. Thereja)

2.1 Introduction on

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:

3.1 Mesh Analysis

3.2 Mesh Equations by inspection

3.3 Super mesh Analysis

3.4 Nodal Analysis

3.5 Nodal Equations by inspection

3.6 Super node Analysis

3.7 Source Transformation Technique

4. NETWORK THEOREMS:

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:

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 Series resonance & band width in RLC Circuit

5.6 Resonant frequency for a tank circuit

5.7 Q factor & selectivity in series circuit.

5.8 Poly phase Circuit

5.9 Voltage, current & power in star & delta connection

5.10 Deduce expression for active, reactive, apparent power.

5.11 Three phase balanced circuit

6. COUPLED CIRCUITS:

6.1 Self Inductance
6.2 Conductively coupled circuit and mutual impedance
6.3 Mutual Inductance
6.4 Dot convention
6.5 Coefficient of coupling
6.6 Series and parallel connection of coupled inductors

7. TRANSIENTS (DC & AC):

7.1 Steady state & transient response
7.2 DC response to R-L, R-C & RLC circuit
7.3 Application of Laplace transform for solution of D.C transient circuits.

8. TWO-PORT NETWORK:

8.1 Open circuit impedance (z) parameters
8.2 Short circuit admittance (y) parameters
8.3 Transmission (ABCD) parameters
8.4 Hybrid (n) parameters
8.5 Inter relationships at different parameters
8.6 Inter connection of two port networks
8.7 T and π representation

9. FILTERS:

9.1 Classification of filters
9.2 Filter networks
9.3 Equations of filter networks
9.4 Classification of pass Band and stop Band
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 M- derived T section
9.9 Band pass filter
9.10 Band elimination filler

TEXT: 1. CIRCUIT & NETWORKS By: A. Sudhakar & Shyam Mohan S Palli
for modules:- 1,3,4,5,6,7,8,9, Publisher – Tata – Mc Graw Hill.
2. Electrical Technology Volume – I, By- B. L. Thereja for module: 2 only
Publisher: S. Chand

Principle of Mechanical Engineering

Total Period : 75(60L + 15T) **Exam – 3 Hrs**
Periods: (5 p/weak) **Total Marks – 100**
Theory – 80
IA - 20

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 electrical generation and power plant.

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.

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**

Principle of Mechanical Engineering

Chapters:

1. **THERMODYNAICS:**
   - 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:**
   - 2.1 Use steam table for solution of simple problem
   - 2.2 Explain total heat of wet, dry and super heated steam
3. **BOILERS:**
   - 3.1 State types of Boilers
   - 3.2 Describe Cochran, Babcock Wilcox boiler
   - 3.3 Describe Mountings and accessories
4. **STEAM ENGINES:**
   - 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:**
   - 5.1 State Types
   - 5.2 Differentiate between impulse and reaction Turbine
6. **CONDENSER:**
   - 6.1 Explain the function of condenser
   - 6.2 State their types
7. **I.C. ENGINE:**
   - 7.1 Explain working of two stroke and 4 stroke petrol and Diesel engines.
   - 7.2 Differentiate between them
8. **HYDROSTATICS:**
   - 8.1 Describe properties of fluid
   - 8.2 Determine pressure at a point, pressure measuring Instruments
9. **HYDROKINETICS:**
   - 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:**
    - 10.1 Intensifier
    - 10.2 Hydraulic lift
    - 10.3 Accumulator
    - 10.4 Hydraulic ram

TEXT BOOK:

1. Thermal Engg. By: R. S. Khurmi
2. Hydraulics & Hydraulic M/Cs By: A. R. Basu

Ref:

1. Thermal Engg. By: A. S. Sarad
2. Hydraulic & Hydraulics M/C By: R. K. Bansal

Electrical Engineering Materials

Total Period : 60 (4 p/weak)

Exam – 3 Hrs
Total Marks – 100
Theory – 80
IA - 20(15+5)

A. Rationale:

Electrical Engg. Materials holds 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 in 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.

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**

Electrical Engineering Materials

Chapters:

- 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:

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:

5.1 Introduction
5.2 Classification
- 5.2.1 Diamagnetism
- 5.2.2 Paramagnetism
- 5.2.3 Ferromagnetism

5.3 Magnetisation Curve
5.4 Hysteresis
5.5 Eddy Currents
5.6 Curie Point
5.7 Magnetostriction
5.8 Soft and Hard magnetic Materials
- 5.8.1 Soft magnetic materials
- 5.8.2 Hard magnetic materials

6. Materials for Special Purposes

6.1 Introduction
6.2 Structural Materials
6.3 Protective Materials
- 6.3.1 Lead
- 6.3.2 Steel tapes, wires and strips
- 6.3.3 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

TEXT: 1. Electrical Engg. Material & Electronic components By: K.B.Raina, S. K. Bhattacharya, T. Joneja, Publisher: S. K. Kataria & Sons

Engineering Mathematics – III

L	T	P
4	0	0

Theory	: 100
End Term Exam	: 80
I.A.	: 20

OBJECTIVE

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

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

COURSE CONTENT **PERIODS**

1. MATRICES **04**

1.1 Define rank of a matrix.
1.2 Perform elementary row transformation to determine rank of a matrix.
1.3 Define 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 DIFFERNTIAL EQUATION **12**

2.1 Define homogeneous & non homogeneous diff. Equations with constant coefficient with examples.
2.2 Find general solution of linear equations in terms of C.F & P.I.
2.3 Derive rules of finding C.F & P.I in terms of operator D.
2.4 Explain method of variation of parameter to solve equation of the form $y''+py'+qy=f(x)$.
2.5 Describe methods of solutions of Cauchy's & Legendre's linear equation with variable co efficient.
2.6 Define partial differential equations(P.D.E.).
2.7 Form partial differential equations by eliminating arbitrary constants & arbitrary functions.
2.8 Solve partial differential equations of the form $Pp+Qq=R$.
2.9 Derive rules of finding C.F and P.I of Homogeneous linear partial differential equation with constant coefficient solve problems in relation to O.D.E. & P.D.E.

3. LAPLACE TRANSFORM (L.T.) **12**

3.1 Define Gamma function and $\Gamma(n+1) = n!$ and find $\Gamma(\frac{1}{2})$ = (No problem).
3.2 Define laplace transform of a function f(t) & inverse laplace transform.
3.3 Derive L.T of standard functions and explain existence conditions of L.T.
3.4 Explain linearity, shifting and change of scale properly of L.T.
3.5 Formulate L.T of derivatives, integrals, multiplication by t^n , division by t.
3.6 Derive formula of inverse L.T.
3.7 State and derive convolution theorem.
3.8 Solve linear differential equation with constant coefficients associated with initial conditions using transform method.

3.9 Define unit step function and derive second shifting property.
3.10 Solve problem from 3.3 to 3.9.

4. FOURIER SERIES (F.S.) **12**

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 Obtain F.S of continuous functions & functions having points of discontinuously
4.6 Obtain F.S of functions having arbitrary period.
4.7 Define even and odd functions and obtain their F.S.
4.8 Explain half range series.
4.9 Solve problems on 4.1 to 4.8.

5. NUMERICAL METHODS **04**

5.1 Appraise limitation of analytic method of solution of algebraic & transcendental equations.
5.2 Derive iterative formula for finding solutions of algebraic & transcendental equations by
  5.2.1 Bisection method.
  5.2.2 Method of false position.
  5.2.3 Newton Raphson method.
5.3 Solve problems on 5.2.

6. FINITE DIFFERNCE & INTERPOLATION **12**

6.1 Explain finite difference & form table for forward & backward difference.
6.2 Explain differences of a polynomial and express it in factorial notation.
6.3 Define shift operator E and establish relation between E,
6.4 Derive Newton's forward and backward interpolation formula for equal interval.
6.5 State lagrange's interpolation formula for unequal intervals.
6.6 Derive numerical differentiation using forward and backward difference.
6.7 Explain numerical integration and state
  6.7.1 Newton-cote's formula.
  6.7.2 Trapezoidal rule.
  6.7.3 Simpson's 1/3 rule.
6.8 Solve problems on 6.1 to 6.7.

7. NUMERICAL SOLUTION OF ORDINARY DIFFENTIAL EQUATIONS **04**

7.1 State and explain formula for solving ordinary differential equations using
  7.1.1 Taylor's series method.
  7.1.2 Euler's method.
  7.1.3 Runga-kutte method up to 4^{th} order.

TEXT BOOKS

1. Higher Engineering Mathematics by Dr. B.S.Grewal.

REFERENCE

1. Numerical Methods by Goel & Mittal
2. A Text Book of Matrix Algebra by S. Biswas
3. Numerical Methods for Engineering by S. K. Gupta
4. Partial Differential Equation by P. Prasad & R. Rabindran
5. Theory of Matrices by Vatssa

CIRCUIT LAB

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 type of filters
3. Know to draw different circuits using P-Spice software

C. Course content in terms of specific objectives:

1. Verification of :
   a. Super position theorem
   b. Thieving's Theorem
   c. Norton's Theorem
   d. Milliman's Theorem
   e. Maximum power transfer Theorem
2. Determine resonant frequency of series R-L-C circuit
3. Study of High pass filter & determination of cut-off frequency
4. Study of low pass filter & determination of cut-off frequency
5. Study of Band pass filter and Band Elimination filter & determination of its cut-off
   Frequency
6. Develop the circuit diagram and explain response of parallel resonant circuit
7. Analysis the charging and discharging of an R-C & R-L circuit with oscilloscope.
   Compute the tire constant from the tabulated data and determine the rise time
   graphically.
8. Circuit simulation using p-SPICE/Mat lab Software
   Construct above circuits using P-SPICE/ Mat Lab software and compare the
   measurements and wave forms.
9. Determination of parameters of Two port Network