

**SAURASHTRA UNIVERSITY, RAJKOT****SEMESTER III B.E.****[ ELECTRICAL & ELECTRONICS ENGINEERING ]**

<b>Code</b>	<b>Subject</b>	<b>Teaching Scheme</b>				<b>Exam Scheme</b>		
		Lect.	Pra	Theory	Paper Hrs.	Prac/ Oral	Term Work	Total
301	Engineering Mathematics	4	-	100	3	-	-	100
302	Programming Techniques	4	2	100	3	25	25	150
303	Electrical Machines - I	4	2	100	3	25	25	150
304	Electrical Measurement	4	2	100	3	25	25	150
305	Principles of Electronics Circuits	4	2	100	3	25	25	150
306	Electrical Workshop	-	2	-	-	25	25	50
<b>TOTAL</b>		<b>20</b>	<b>10</b>	<b>500</b>	<b>-</b>	<b>125</b>	<b>125</b>	<b>750</b>

**SAURASHTRA UNIVERSITY, RAJKOT**  
**B.E. SEM III ( EEE )**

**EEE - 301 : ENGG. MATHEMATICS**

TEACHING SCHEME			EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THEORY Marks	PAPER Hours	PRACTICAL Marks	ORAL Marks	TERMWORK Marks	TOTAL
4	-	100	3	-	-	-	100

**1 FOURIER SERIES :**

Definitions, Euler's formulae, Condition for a Fourier Expansion, Functions having points of discontinuity, Change of interval, Odd and even function, Half range series, Harmonic analysis.

**2. VECTOR CALCULUS :**

Differentiation :

Introduction, vector function of a scalar Quantity, Decomposition of a vector function, vector differentiation, Geometrical interpretation, velocity and acceleration, standard results, point function, vector operator  $\text{Del } \nabla$ , Gradient, Geometrical Meaning of  $\text{Grad } \phi$ , standard Results, divergence and curl, physical interpretation of divergence, physical interpretation of curl,  $\text{div grad } \phi$  or  $\nabla^2 \phi$ .

**3. ORDINARY DIFFERENTIAL EQUATIONS :**

Linear differential equations of higher order with constant coefficients, Methods of variations of parameters, Cauchy's and Legendre's Linear equations, Simultaneous linear equations with constant coefficients, Applications of linear differential equations, Solution of Bessel's and Legendre's equations by series Properties like recurrence relations, Orthogonality.

**4. PARTIAL DIFFERENTIAL EQUATION :**

Formation of differential equations, Directly integrable equations, Linear and nonlinear equations of first order, Homogeneous linear equations with constant coefficient, Applications of partial differential equations.

**5. NUMERICAL METHODS :**

Solution of algebraic and transcendental equations by Bisection method, Newton-Raphson, False position, Iteration and extended iteration methods, Convergence of these methods.

**6. COMPLETE INTEGRATION :**

Cauchy's integral theorem and formulae, Residue theorem, Contour integration without indentation, Conformal mapping and bilinear transformation.

**REFERENCE BOOKS :**

Higher Engineering Mathematics  
Engineering Mathematics Vol. I, II, III, IV  
Engineering Mathematics Vol. I  
A Text of On Engineering mathematics II  
Engineering Mathematics  
Mathematics for Engineering Students

Dr. B. S. Grewal.  
Kumbhojkar G. V.  
Prof. Wartikar & Wartikar  
N. P. Bali, Ashok Sexena & Iyenger  
Dhavan & Shivastav  
P. D. S. Verma

**SAURASHTRA UNIVERSITY, RAJKOT**  
**B.E. SEM III ( EEE )**

**EEE - 302 : PROGRAMMING TECHNIQUES**

TEACHING SCHEME		EXAMINATION SCHEME					
THEORY Hours	PRACTICAL Hours	THEORY Marks	PAPER Hours	PRACTICAL Marks	ORAL Marks	TERMWORK Marks	TOTAL Marks
4	2	100	3	25		25	150

**PART - A**

**1. REVISIONS OF C AND PROGRAMMER DEFINED FUNCTIONS :**

Overview of datatypes, variables and constants in C, Control statements, arrays and string manipulations introduction, declaration and definition of functions, function parameters and return values, calling a function, passing parameters by value and by reference, nesting of functions, recursion, visibility and lifetime of variables in a functions, ANSI C functions.

**2. STRUCTURES AND UNIONS :**

Structure definition, initializing structures and accessing its members, comparison of structure variables, structure arrays and arrays in structures, structure as a part of another structure, structures and functions. size of structures unions.

**3. POINTERS :**

Understanding pointers, accessing the address of a variable, declaring and initializing pointers, accessing variables through its pointer, pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and character strings, pointers and functions, pointers and structures.

**4. FILE MANAGEMENT :**

Introduction, defining, opening and closing a file, input/output operations on file. Error handling. random access to files. command line arguments. Dynamic memory allocation and linked lists : introduction to dynamic memory allocation concepts of linked lists, advantage of linked, lists types of linked lists, pointers revisited. basic list operations. application of linked lists.

**5. GRAPHICS IN C :**

Introduction to graphics mode, difference between text and graphics mode, initializing graphics mode in C, graphics library and its introduction, useful graphic functions for drawing points, lines, arcs, circles, rectangles, polygons and ellipses, functions to set and get back-color, fill - color, x-y coordinates, text settings, palette settings and pixels, functions to handle images, functions to set and get settings for active page, visible page and view port, pre-defined functions to draw 2D and 3D bar charts, drawing straight line charts and curves use of library functions to draw vector diagrams and circle diagrams for simple R-L-C circuits.

**PART - B : TOPICS IN THIS PART ( 6-10 ) SHOULD BE COVERED USING PSPICE, MATLAB OR ANY OTHER RELEVANT ADVANCED SOFTWARE PACKAGE ( DURING LAB. SESSION )**

**6. SOFTWARE PACKAGES AND NETWORK FORMATION :**

Introduction to latest relevant software packages for study and analysis of electrical circuits by simulation, representation of basic circuit elements like resistance, inductor and capacitor, time invariant voltage sources and current sources, time variant sources such as exponential, sinusoidal, ideal and real time pulse, circuit formation by identifying nodes.

**7. DC ANALYSIS :**

Calculations of node voltages and branch currents for the resistive networks, simulation of DC analysis like operating point, small signal transfer function and DC sweep analysis, modeling of sources in DC analysis - voltage controlled voltage source, current controlled voltage source, current controlled current source and voltage controlled current source, examples based on resistive networks and simple transistor circuits.

**8. TRANSIENT ANALYSIS :**

Modeling of time variant sources, inductors and capacitors, transient output variables, setting up voltages at nodes and branch current as initial transient conditions, statements or

procedure for transient analysis, calculations and plot of response of circuits consisting of combination of R, L and C, simulation of switches in the networks and their operations.

**9. AC ANALYSIS :**

Modeling of AC single phase and three phase sources, effect of change in frequency on a given circuit by plotting frequency response, response of the circuit at resonance in series or parallel, plot of instantaneous currents in a three phase circuit, calculations of equivalent impedance and plot of overall response of simple circuits.

**10. NETWORK COMPUTATIONS :**

Formation of simultaneous equations and use of determinant method in solving complex networks, solution of higher order differential equations, Samples demonstrations for application of computers in matrix computations, 3-D charts and simulations of real time problems.

**REFERENCE BOOKS :**

- |    |   |                   |
|----|---|-------------------|
| 1. | Programming in ANSI C                           | E Bakagurasamy    |
| 2. | Programming with C                              | Byron Gottfried   |
| 3. | Let us C  | Yashvant Kanetkar |
| 4. | Graphics in C                                   | Yashvant Kanetkar |
| 5. | SPICE for circuits and Electronics using PSPICE | M H Rashid        |

**SAURASHTRA UNIVERSITY, RAJKOT**  
**B.E. SEM III ( EEE )**

**EEE - 303 : ELECTRICAL MACHINE - I**

TEACHING SCHEME			EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	Marks	THEORY Hours	PAPER Marks	PRACTICAL/ORAL Marks	TERMWORK Marks	TOTAL
4	2	100	3	25		25	150

**1. D.C. MACHINES :**

Introduction, Constructions Features **D.C. Generations** : Principle of operation, Action of commutator, E.M.F. equation, Armature reaction, Commutation, Reactive Voltage, Methods of Improving Commutation, Compensating winding, Types of D.C. Generators, Losses, Power stages and efficiency **D.C. Generators Characteristics** : Magnetization curve, field resistance line, Cha. of separately excited generators. cha. of shunt & series generators, Determination of critical resistance from O.C.C. for shunt generator, Critical speed, Conditions for self excitation & causes of failure to build up voltage, **D.C. Motors** : Introduction, Principle of operation, comparison of motor & Generator action, Direction of Rotation of motor, Significance of Back E.M.F. power equation, Condition for maximum power output, Speed & Torque equation, Types of D.C. motors, Characteristics of D.C. Motors, applications. **Starting of D.C. Motors** : Necessity of starter, three point & four point starter, Calculation of step resistance for starter, speed control of D.C. shunt & series motor.

**2. 1-PHASE TRANSFORMER :**

Introduction, Construction, features, Working Principle, Classifications, ideal transformer on no load, E.M.F. equation & transformation ratio, Transformer on load, Resistance & leakage reactance, Vector diagram of actual transformer on load, Equivalent Resistance & reactance, Voltage Regulation, Equivalent Circuit, Losses & Efficiency, All day efficiency, Open circuit & short circuit test, sumpner's (back to back) Test, parallel operation, load sharing by two transformers, Auto transformer, off-load & on-load tap change, introduction of C.T. & P.T.

**3. POLYPHASE INDUCTION MOTOR :**

Introduction, Construction, types of 3-phase induction motors, Principles of operation slip, Frequency of rotor current ( or E.M.F.) rotor E.M.F. rotor current, Torque, starting torque, condition for maximum torque, torque slip and torque speed curves, effect of change in supply voltage on starting torque. Effect of change in supply voltage on torque and slip, full load torque, and maximum torque, starting torque and maximum torque, power stages in an induction motor, Rotor output equivalent circuit of an induction motor, vector diagram of an induction motor, maximum power output Testing of induction motor, measurement of slip.

**4. Alternator :**

Construction and working principle, production o sinusoidal alternating E.M.F. frequency of induced E.M.F. Armature windings, Classification of windings, coil span factor or pitch factor, distribution, Breadth or winding factor, E.M.F. equation, wave shape, Rating of alternators, Leakage Reactance, Armature Reaction, Synchronous impedance, effect of variation of power factor on terminal voltage alternator on load, percentage Resistance, Reactance and impedance, Laboratory method of determination of synchronous reactance, Voltage regulation, Synchronous impedance method.

**REFERENCE BOOKS :**

- |  |               |
|--|---------------|
| 1. A text book of electrical Technology Vol - II | B. L. Theraja |
| 2. Theory & Performance of A.C. Machines         | M. G. Say     |
| 3. Theory & Performance of Electrical Machines   | J. B. Gupta   |
| 4. D. C. Machines                                | Clayton       |

**SAURASHTRA UNIVERSITY, RAJKOT**  
**B.E. SEM III ( EEE )**

**EEE - 304 : ELECTRICAL MEASUREMENT**

TEACHING SCHEME			EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THEORY Marks	PAPER Hours	PRACTICAL Marks	ORAL Marks	TERMWORK Marks	TOTAL
4	2	100	3	25		25	150

**1. INTRODUCTION :**

Introduction of measurement, measurement terms, resolution and sensitivity, Accuracy and precision, types of errors.

**2. ELECTRICAL MEASURING INSTRUMENTS :**

Introduction, indicating instrument, moving - iron instruments, attractions, attraction - type moving iron (coil) instrument, Errors in moving iron instrument, permanent magnet moving coil (PMMC) instrument, Extension of instrument Range, Dynamometer-type Wattmeter, power factor meter, Frequency meter, Q-meter, induction - type single phase & three phase Energy meter, Testing and Calibration of energy meter, phantom or Fictitious load, megger,

**3. MEASUREMENT OF RESISTANCE :**

Classification, measurement of low resistance, measurement of medium resistance, measurement of high resistance, Ohm meters, Multimeter, Megger, Continuity Tester, Measurement of insulation Resistance when Power is on, Measurement of earth connection.

**4. THREE PHASE POWER MEASUREMENT :**

Measurement of power in three phase circuit, one wattmeter method, three wattmeter method, two wattmeter method, effect of powerfactor on wattmeters reading, examples.

**5. POTENTIOMETER :**

Introduction, simple, DC potentiometer, Constructional details, practical applications, Classifications of AC potentiometer, Drysdale AC polar potentiometer, Gall Tinsley AC potentiometer, Advantages & limitations of AC potentiometer.

**6. MAGNETIC MEASUREMENT :**

Classification of magnetic measurements, Grassot flux meter, methods of measuring iron losses.

**7. A.C. BRIDGES :**

Introduction, General Equation for Bridge balance, Balance adjustment of AC bridges, Maxwell's Bridge, Maxwell Wein Bridge, Anderson Bridge, Hay Bridge, Owen Bridge, capacitance bridges, Measurement of mutual inductance, sources of errors in bridge measurement and elimination of errors, screening of bridge elements.

**8. TRANSDUCERS :**

Introduction, Mechanical Spring Devices, Pressure Sensitive Primary Devices, Transducers, Electrical Transducers, Basic Requirement of a Transducer, Classification of transducers, Resistive transducer, Strain Gauges, inductive transducer, Linear variable differential transformer (LVDT), Rotary variable differential transformer (RVDT) Capacitive Transducers, Photoelectric transducers. Displacement Measurement, Strain Measurement Pressure Measurement, Measurement of Linear Velocity, Measurement of Angular Velocity, Temperature Measurement.

**REFERENCE BOOKS :**

- |   |                   |
|---|-------------------|
| 1. Electrical & Electronic Measurements & Instrumentation | A. K. Sawhney     |
| 2. Electrical & Electronic Measurements & Instrumentation | J. B. Gupta       |
| 3. Electronics Instrumentation & Measurements Techniques  | Cooper & Helfrick |

**SAURASHTRA UNIVERSITY, RAJKOT**  
**B.E. SEM III ( EEE )**

**EEE - 305 : PRINCIPLES OF ELECTRONICS CIRCUITS**

TEACHING SCHEME			EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THEORY Marks	PAPER Hours	PRACTICAL Marks	ORAL Marks	TERMWORK Marks	TOTAL
4	2	100	3	25		25	150

**1. BIASING OF TRANSISTOR AND THERMAL STABILIGY :**

Different types of biasing circuits and their analysis, operating point, bias stability, Stability factor, Compensation, thermistor compensation, thermal runaway.

**2. SMALL SIGNAL LOW FREQUENCY TRANSISTOR MODEL :**

h-parameters, necessity of hybrid model and h parameters, Determination of h-parameters from transistor characteristics, Approximate conversion formulae for h - parameters of the three configurations, ac equivalent circuits of transistor amplifiers using h parameters, approximate equivalent circuits. Low frequency response of transistor amplifier, effect of bypass and coupling capacitor on low frequency response of BJT amplifiers, step response, calculations (cut off freq.) JFET amplifier, Low frequency response of common source amplifier, low freq. H parameter model of FET, effect of source bypass capacitor, Response of multistage amplifier, Darlington pair & its biasing, Bootstrapping techniques.

**3. TRANSISTOR AT HIGH FREQUENCY :**

Hybrid II model for CE amplifier, approximate high frequency model, CE short circuit current gain, Gain bandwidth product, Response with resistive load, Effect of source resistance, Response of multistage high freq. model of FET.

**4. WAVE SHAPPING CIRCUITS :**

Low pass filter, high pass filter, Clipper & clamper circuit concepts, Voltage multiplier.

**5. AMPLIFIER :**

Classification of amplifiers based on coupling, operating point, operating freq. (low Fr. medium Fr. HFm UHF, Audio/Video), Feedback & non feedback, output (V, I,W) special amplifier ( Differential Amplifier ) Design of small signal low frequency amplifiers, two stage R-C coupled amplifier.

**FEEDBACK AMPLIFIERS :**

Definition of feedback, general theory of feedback, negative feedback, effect of negative feedback on stability, bandwidth, distortion, input and output impedance, Detailed analysis of voltage series, voltage shunt, current series and current shunt feedback, Emitter follower voltage series and voltage shunt feedback amplifier, Examples.

**POWER AMPLIFIERS :**

Class A large signal amplifier, Distortion, Second harmonic distortion, Higher order harmonic distortion efficiency, Class - A audio power amplifier, push pull Class - AB amplifier, Class B push - pull amplifier, cross over distortion, complementary symmetry class B power amplifier thermal considerations.

**6. OSCILLATORS :**

Multivibrator concept, Astable multivibrator, Analysis using waveforms, monostable multivibrator, Bistable multivibrators, Schmitt trigger, positive feedback, Harmonic oscillators & Relaxation oscillators, Barkhausen's criteria of oscillation, Wien bridge oscillator, Phase-shift oscillator, Hartley oscillator, Collpitt's oscillator, Crystal oscillator, frequency stability, applications of oscillators, UJT relaxation oscillator.

**REFERENCE BOOKS :**

- |   |                      |
|---|----------------------|
| 1. Electronic Devices and Circuits        | Millman Halkies      |
| 2. Electronic Principles                  | A. P. Malvino        |
| 3. Electronics Devices and Circuits       | Allen Mottershad. A. |
| 4. Transistor Circuit Design              | Texas Instruments    |
| 5. Pulse, Digital and Switching waveforms | Millman Taub         |
| 6. Electronic Circuit Design              | Talbar & Sontakke    |

**SAURASHTRA UNIVERSITY, RAJKOT**  
**B.E. SEM III ( EEE )**

**EEE - 306 : ELECTRICAL WORKSHOP**

TEACHING SCHEME			EXAMINATION SCHEME				
THEORY Hours	PRACTICAL Hours	THEORY Marks	PAPER Hours	PRACTICAL Marks	ORAL Marks	TERMWORK Marks	TOTAL
4	2	100	3	25		25	150

**1. TESTING OF PASSIVE COMPONENTS & COMMON ELECTRIC HOME APPLIANCES :**

Study of most common defects in resistance, capacitor and inductors, various test procedures for checking resistance, Rheostat, Capacitor and inductors, Testing of electric iron, Fan & speed regulator, Electric Mixer, Tubelight.

**2. BUILDING AND INDUSTRIAL INSTALLATION :**

Safety precautions in Electrical installations, Calculation of fuse and MCB rating, Testing of insulation Resistance and earth Resistance.

**3. DESIGN OF BUILDING WIRING :**

Type of Wiring, Selection of wires and rating, Calculation of fuse and circuit breaker Rating, A case study of college wiring, prepare a sheet of house wiring.

**4. STUDY OF TRANSFORMER OIL CHARACTERISTICS :**

Property of insulation oil for transformer, Testing of Dielectric strength of transformer understanding incipient fault phenomena.

**5. STUDY OF STARTING & RUNNING CONDITIONS OF DC MACHINES :**

Methods of starting different types of dc machines and running under different conditions

**6. STUDY OF STARTING & RUNNING CONDITIONS**

**1 -  $\phi$  AND 3 -  $\phi$  INDUCTION MOTOR :**

Starting of 1 -  $\phi$  and 3 -  $\phi$  induction motors using various startes and running under different conditions

**7. IDENTIFICATION OF DIFFERENT WINDING OF A D.C. MACHINE :**

To acquire knowledge of identifying the terminals of various D.C. motor, Lap & wave winding, Measurement of resistance of different winding.

**8. STUDY OF TUBELIGHT & MOONLIGHT WIRING :**

Tubelight wiring and its components testing, moonlight wiring, its components and formation of decorative series of moonlight lamps.

**9. ELECTROMECHANICAL DEVICES :**

Relays and contactors, Use of relays contact configuration, electrical Actuators, specification and standards.

**REFERENCE BOOKS :**

- |  |              |
|--|--------------|
| 1. Electrical Estimating, Costing & Wiring       | S. L. Uppal  |
| 2. Modern Electrical & Electronis Practice       | M. R. Patel  |
| 3. Electrical Estimating & Costing               | Surjit Singh |
| 4. Basic shop Practical in Electrical Engg.      | M. N. Anwani |
| 5. Electrical installation, Estimating & Costing | J. B. Gupta  |