COURSES & EXAMINATION SCHEME

For

B. Tech. Electrical Engineering

YEAR II, SEMESTER –III

(Effective from the session: 2010-2011)

Uttrakhand Technical University, Dehradun

w.e.f. 2010-11
## COURSES AND EVALUATION SCHEME
### B.TECH. II YEAR, SEMESTER-III
#### ELECTRICAL ENGINEERING
**EFFECTIVE FROM SESSION :-2010-2011**

<table>
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<tr>
<th>S. No.</th>
<th>Course No.</th>
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TMA – 301  MATHEMATICS-III

Unit – I: Function of Complex variable
Analytic function, C-R equations, Cauchy’s integral theorem, Cauchy’s integral formula for derivatives of analytic function, Taylor’s and Laurent’s series, singularities, Residue theorem, Evaluation of real integrals
of the type \( \int_0^{2\pi} f(Cos\theta.Sin\theta)d\theta \) and \( \int_{-\infty}^{\infty} f(x)dx \)

Unit –II: Statistical Techniques - I
Moments, Moment generating functions, Skewness, Kurtosis, Curve Fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc, Correlation and Regression. Probability theory.

Unit – III: Statistical Techniques – II
Binomial distribution, Poisson distribution, Normal distribution, Sampling theory (small and large), Tests of significations: Chi-square test, t-test, Analysis of variance (one way), Application to engineering, medicine, agriculture etc.
Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, \( \bar{X} \) R, p, np, and c charts.

Unit – IV: Numerical Techniques –I
Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, difference tables, Newton’s forward and backward interpolation, Lagrange’s and Newton’s divided difference formula for unequal intervals.

Unit – V: Numerical Techniques –II
Solution of system of linear equations, Gauss-Seidal method, Crout method. Numerical differentiation, Numerical integration, Trapezoidal, Simpson’s one third and three-eight rules, Solution of ordinary differential (first order, second order and simultaneous) equations by Euler’s, Picard’s and forth-order Runge- Kutta methods.

Reference Books:-
TEE 301 BASIC NETWORK ANALYSIS

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Unit – I: Introduction to continuous time signals and systems
Basic continuous time signals, unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics. Introduction to various types of systems.

Analogous System
Linear mechanical elements, force-voltage and force-current analogy, modeling of mechanical and electro-mechanical systems: Analysis of first and second order linear systems by classical method.

(10)

Unit – II: Graph Theory
Graph of a Network, definitions, tree, co tree, link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.

(8)

Unit – III: Network Theorems (Applications to ac networks)
Super-position theorem, Thevenin’s theorem, Norton’s theorem, maximum power transfer theorem, Reciprocity theorem. Millman’s theorem, compensation theorem, Tellegen’s theorem

(8)

Unit – IV: Transform methods of Analysis
Exponential form and Trigonometric form of Fourier series, Fourier symmetry, Fourier Integral and Fourier Transform. Transform of common functions and periodic wave forms: Applications of Fourier Transform to network analysis.

(6)

Unit – V: Laplace Transform Analysis

(8)

Reference Books:
1. Kuo, Network Analysis & Synthesis, Wiley India
2. Jagan, Network Analysis, B S Publication
3. ME Van-Valkenberg; “ Network Analysis”, Prentice Hall of India
5. Donald E. Scott, “Introduction to circuit Analysis” M.C. Graw Hill

w.e.f. 2010-11
TME-304: THERMAL AND FLUID MACHINES

UNIT-I
Thermodynamic equilibrium, cyclic process, enthalpy, Zero, first and second laws of thermodynamics, cannot cycle, concept of entropy, properties of steam, processes involving steam in closed and open systems, Enthalpy.
Vapour Pressure Cycles: Rankine cycle, reheat cycle, Regenerative cycle

UNIT-II: Steam Turbine
Classification, impulse and reaction turbines their velocity diagrams and related calculations, workdone and efficiencies, re-heat factor, staging, bleeding and governing of turbines.
Gas Turbine:
Classification, Brayton cycle, working principle of gas turbine, gas turbine cycle with intercooling, reheat and regeneration, stage and polytrophic efficiencies.

UNIT-III
Compressors: Classification, single and multistage reciprocating compressors, isothermal and volumetric efficiencies, centrifugal and axial flow compressors, surging, choking and stalling.
L.C. Engines: Otto, Diesel , and Dual cycles, introduction to 2-stroke and 4-stroke SI and CI engines, indicator diagram and power measurement.

UNIT-IV
Hydraulic Turbines:
Classification, heads and efficiencies, construction, working, work done and efficiency of impulse and reaction turbines.

Reference Books:
1. Introduction to Fluid Mechanics, Fox, John Wiley & Sons

w.e.f. 2010-11
TEE-302 ELECTRICAL MEASUREMENT INSTRUMENTS L T P

UNIT I:
Philosophy Of Measurement: Methods of Measurement, Measurement System, Classification of instrument system, Characteristics of instruments & measurement system, Errors in measurement & its analysis, Standards.
Analog Measurement of Electrical Quantities: Electrodynamio, Thermocouple, Electrostatic & Rectifier type Ammeters & Voltmeters, Electrodynamio Wattmeter, Three Phase Wattmeter, Power in three phase system , errors & remedies in wattmeter and energy meter.

UNIT II:
Instrument Transformers: Theory, construction, characteristics and their application of current and potential transformers. Ration and phase angle errors and their minimization, Introduction to measurement of speed, frequency and power factor.

UNIT III:

UNIT IV:
AC Potentiometer: Polar type & Co-ordinate type AC potentiometers , application of AC Potentiometers in electrical measurement
Magnetic Measurement: Ballistic Galvanometer , flux meter , determination of hysteresis loop, measurement of iron losses.

UNIT V:
Digital Measurement of Electrical Quantities: Concept of digital measurement, block diagram, Study of digital voltmeter, frequency meter, Power Analyzer and Harmonics Analyzer; Electronic Multimeter.
Cathode Ray Oscilloscope : Basic CRO circuit (Block Diagram),Cathode ray tube (CRT) & its components , application of CRO in measurement ,Lissajous Pattern.; Dual Trace & Dual Beam Oscilloscopes.

Reference Books:

w.e.f. 2010-11
TEC-304  SOLID-STATE DEVICES AND CIRCUITS  

Unit-I  
Special Diodes: LED, Varactor, Photodiode, Schotkey, tunnel diodes and their constructions and characteristics.  
Linear Wave shaping: RC low pass and high pass circuits and response to sine and square wave inputs, RC circuit as differentiator, integrator & compensated attenuator.  

(5)  

Unit-II  
Frequency Response: Low and high frequency response of common emitter and common source amplifiers. Multistage amplifiers: Cascade, cascade and Darlington pair.  

(6)  

Unit-III  
Feedback: General feedback structure, properties of negative feedback, four basic feedback topologies: series shunt; series-series; shunt-shunt; & shunt-series feedback amplifier, determination of Loop gain, stability problem.  

(6)  

Unit-IV  
Timer: 1C 555 timer and its applications.  
Voltage regulators: Concept of series, shunt and switching regulators,  
Converters: Sample & hold circuit, A/D and D/A converters  

(6) (1) (3) (2)  

Unit-V  
Op-Amp Applications: Astable and monostable multivibrators, schmitttrigger, VCO and PLL; simple active filters (LP, NP, BP and notch type)  
Op-amp based configurations, fixed and adjustable voltage 1C regulators.  

(5) (3)  

Reference Book  
1. Ibbotson, Introduction to Solid State Devices, Wadsworth  
2. R.K. Singh & D. S. Chauhan, Solid State Devices and Material, Wiley India  

w.e.f. 2010-11
## TEC-305  DIGITAL ELECTRONICS

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<thead>
<tr>
<th>Unit-I</th>
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<tr>
<td><strong>Logic Families:</strong> Circuit concepts and comparison of logic families: TTL, CMOS, NMOS and ECL; characteristic parameters: logic levels/fan-in and fan out, noise margin, propagation delay and power consumption.</td>
<td>(5)</td>
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<td><strong>Minimization of Boolean functions using</strong> (i) Karnaugh Map having don't care entries and (ii) tabular method.</td>
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<th>Unit-II</th>
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<tr>
<td><strong>Arithmetic Logic Circuits:</strong> Representation of negative numbers, 9's and 10's complements, 1's and 2's complements, arithmetic operation using 2's complements. Adders and Subtracters, magnitude comparator.</td>
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<td><strong>Combinational Logic Circuits:</strong> Multiplexers/ Demultiplexers, encoders/decoders, PAL and PLA.</td>
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<th>Unit-III</th>
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<tr>
<td><strong>Sequential Logic Circuits:</strong> Latches&amp; Flip-Flops : SR, D, T, JK and Master-slave JK.</td>
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<td><strong>Shift Registers:</strong> Basic principle, serial and parallel data transfer, shift left/right register, universal shift register.</td>
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<td><strong>Counters:</strong> Mode N counters, ripple counters, synchronous counters, ring &amp; Johnson counters</td>
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<th>Unit-IV</th>
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<tr>
<td><strong>Memories:</strong> Read Only Memories; Random Access Memories; Static and dynamic; sequential memory: Memory Organization.</td>
<td>(3)</td>
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</tbody>
</table>

### Reference Books:

1. Digital Electronics: Principles and Integrated Circuits, Maini, Wiley India
3. Degin Design, Vahid, Wiley India
5. R.A. Gayakwad,"Op-Amps and Linear Integrated Circuits"Prentice Hall of India,
7. IJ. Nagrath, "Electronics Analog and Digital" Prentice Hall of India Ltd.

w.e.f. 2010-11
PEE 351  SIMULATION LAB

Note: Minimum eight experiments are to be performed from the following list using Matlab/ Multisim/PSIM / PCPIE/any other simulation package

1. Verification of principle of superposition with dc and ac sources
2. Verification of Thevenin and Norton theorem
3. Verification of Maximum power transfer theorems in ac circuits
4. Verification of Tellegen’s theorem for two networks of the same topology
5. Verification of Millman theorem
6. Verification of compensation theorem
7. Determination of transient response of current in RL and RC circuits with step voltage input & current input
8. To obtain transient response of a series R-L-C circuit for step voltage input.
11. To obtain frequency response of a series RLC circuit for sinusoidal voltage input
12. Determination of transient response of current in RLC circuit with step voltage input for under damp, critically damp and over damp cases
13. Determination of frequency response of current in RLC circuit with sinusoidal ac input

* College may add any three experiments in the above list.

PEE – 352  ELECTRICAL MEASUREMENT LAB

Note: Minimum of TEN experiments from the following:

1. Calibration of ac voltmeter and ac ammeter
2. Determination of frequency and phase angle using CRO.
3. Measurement of low resistance by Kelvin’s double bridge
4. Measurement of voltage, current and resistance using dc potentiometer
5. Measurement of inductance by Maxwell’s bridge
6. Measurement of inductance by Hay’s bridge
7. Measurement of inductance by Anderson’s bridge
8. Measurement of capacitance by Owen’s bridge
9. Measurement of capacitance by De Sauty bridge
10. Measurement of capacitance by Schering bridge
11. Plotting of Hysteresis loop for a magnetic material using flux meter.
13. To study the connections and use of Current and potential transformers and to find out ratio error

* College may add any two experiments in the above list

w.e.f. 2010-11
PEC-353  ANALOG & DIGITAL ELECTRONICS LAB  

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1. To Plot V-I characteristics of junction tunnel and schotkey diode.  
2. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the Frequency of oscillation.  
3. To study application of Operational Amplifier as summer integrator and voltage Comparator  
4. To study operation of Op-Amp based astable and monostable multivibrators.  
5. To study operation IC 555 based astable and monostable multivibrators.  
6. To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.  
7. To study operation of Adder / Subtractor using 4 bit / 8 bit IC 7483.  
8. To study operation of (a) J K Master – slave flip – flop using IC 7476 (b) Modulo N- counter using programmable counter IC74190.  
9. To verify experimentally output of A/D and D/A converters.  
10. To study regulation of unregulated power supply using IC 7805/7812 voltage regulator and measure the load and line regulations* College may add two more experiments in the above list  
13. Design of P.S : 220/230 V (AC), 5VDC, 200 mA.  
14. To study operation of Op-Amp based Schmit trigger as IC oscillator and Triangular wave generator  

w.e.f. 2010-11
COURSES & EXAMINATION SCHEME

For

B. Tech. Electrical Engineering

YEAR II, SEMESTER –IV

(Effective from the session: 2010-2011)

Uttrakhand Technical University, Dehradun
### COURSES AND EVALUATION SCHEME

**B.TECH. II YEAR, SEMESTER-IV**  
**ELECTRICAL ENGINEERING**  
**EFFECTIVE FROM SESSION :-2010-2011**

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#### Practical /Design

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w.e.f. 2010-11
UTTARAKHAND TECHNICAL UNIVERSITY
COURSES, SCHEME OF EXAMINATION AND SYLLABUS

TEE 401 ELECTROMECHANICAL ENERGY CONVERSION-I

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Unit –3 : D.C. Machines (Contd.):- Performance Characteristics of D.C. motors, Starting of D.C. motors ; 3-point and 4-point starters, Speed control of D.C. motors: Field Control, armature control and Voltage Control (Semiconductor Device Control method, Ward Leonard method); Efficiency and Testing of D.C. machines (Hopkinson’s and Swinburne’s Test).


Unit –5 : Three Phase Transformers: Construction, three phase transformer phasor groups and their connections, open delta connection, three phase to 2 phase, 6 phase or 12 phase connections, and their applications, parallel operation and load sharing of single phase and three phase transformers, excitation phenomenon and harmonics in transformers, three winding transformers.

Text Books:
1. Principles of Electric Machines and Power Electronics, El Hawary, Wiley India
3. Charles Gross, Electric Machines, T & F , Delhi
5. Principles of Electric Machines and Power Electronics, 2nd ed, Sen, Wiley India

w.e.f. 2010-11
Unit – I : Network Functions :
Concept of Complex frequency, Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot, frequency response and Bode Plots

Unit – II : Two Port Networks:
Characterization of LTI two port networks ZY, ABCD and h-parameters, reciprocity and symmetry, Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks.

Unit – III : Network Synthesis :
Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

Unit – IV : Filters:
Introduction, Classification of filters, introduction of windows, butter wrath filter challenge filter Equation of Ideal filter, Image parameters and characteristics impedance, passive and active filter/ of various filter FCR and CCR filter window matlab fundamentals, low pass, high pass, constant K type, M derived filters and their design.

Unit – V : Sampled Data System
Introduction, Spectrum analysis of sampling process, Signal reconstruction, Difference equation, Z-transform, Z-transform function, Inverse Z-transform, Relation of z- and s-transform, Stability analysis, Application of z-transform

Text Books:
1. Kuo, Network Analysis and Synthesis, 2nd ed, Wiley India
TEE-403: ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

UNIT – I : Crystal Structure of Materials:
Bonds in solids, crystal structure, co-ordination number, atomic radius representation of plane distance b/w two planed packing factor, Miller Indices, Bragg’s law and x-ray diffraction, structural Imperfections, crystal growth (7)

UNIT – II : Dielectric Materials:
Polarization and Dielectric constant, Dielectric constant of mono-atomic, Poly atomic gases and solids, frequency dependence of electronic and ionic polarisabilities, dipolar relaxation, dielectric loss, piezoelectricity, ferroelectric materials (7)

UNIT – III : Electrical Engineering Material:
Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, Half effect, Drift and Diffusion currents, continuity equation, thermoelectric effect, superconductivity and super conducting materials, optical properties of solids (8)

UNIT – IV : Magnetic Material:
Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetismand Ferrimagnetism, magnetostriction, Properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials. (7)

Text Books :
1. A.J. Dekker,”Electrical Engineering Materials” Prentice Hall of India

w.e.f. 2010-11
TEE-404: MICROPROCESSORS and ITS APPLICATIONS

UNIT-I:
Introduction to Microprocessors: Evolution of Microprocessors, history of computers, Timing and control, Memory devices: Semiconductor memory organization, Category of memory

UNIT-II:
8-bit Microprocessors (8085): Architecture, Instruction Set, Addressing modes, Assembly Language Programming.

UNIT-III:
16-bit Microprocessors (8086): Architecture, Physical address, segmentation, memory organization, Bus cycle, Instruction Set, Addressing modes, difference between 8085 & 8086, Assembler Directives, Assembly Language Programming of 8086

UNIT-IV:
Peripheral Interfacing: Introduction, Types of transmission, 8257 (DMA), 8255 (PPI), Serial Data transfer (8251), Keyboard-display controller (8279), Programmable Priority Controller (8259), 8253, ADC, Application of peripheral devices

UNIT-V:
Advanced Microprocessors: Introduction to 80186, 80286, 80386, 80486, Pentium microprocessors, introduction To Microcontroller (8051)

Text Books:
1. Gaonkar, Ramesh S., “Microprocessor Architecture, programming and applications with the 8085” Penram International Publishing 5th Ed.

w.e.f. 2010-11
TEC-401: ELECTROMAGNETIC FIELD THEORY

Unit-I:
Coordinate systems and transformation:
Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke’s theorem, Laplacian of a scalar.

Unit-II:
Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses’s Law – Maxwell’s equation, Electric dipole and flux lines, energy density in electrostatic fields.
Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition.
Electrostatic boundary value problems: Poission’s and Laplace’s equations, general procedures for solving Poission’s or Laplace’s equations, resistance and capacitance, method of images.

Unit-III
Magneto-statics: Magneto-static fields, Biot-Savart’s Law, Ampere’s circuit law, Maxwell’s equation, application of ampere’s law, magnetic flux density, Maxwell’s equation, Maxwell’s equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.

Unit-IV
Waves and applications: Maxwell’s equation, Faraday’s Law, transformer and motional electromotive forces, Displacement current, Maxwell’s equation in final form.
Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.

Unit-V
Transmission lines: Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power, The Smith chart, Some applications of transmission lines.

Text Book
1. Kaduskar, Principles of Electromagnetics, Wiley India

w.e.f. 2010-11
THU 401: Industrial Economics

L T P
2 1 0

Unit-I:
Introduction: Nature & Significance of economics. Relationship between economics and science, Engineering & Technology, Contribution of industrial economics to economic development.

Unit-II:
Micro Economics: Basic concept of Micro Economics. Concept of demand, supply & price, the law pertaining to demand, supply & price indifference curve analysis, price effect, income effect & substitution effect.

Unit-III:

Unit-IV:

Unit-5:

References:

- Ken Heather (2002) The Economics of Industries and Firms
- Essentials of Macroeconomics by Peter Jochumzen - BookBoon, 2010

w.e.f. 2010-11
PEE-451: ELECTROMECHANICAL ENERGY CONVERSION- I LAB

Note: Minimum eight experiments are to be performed from the following list:

1. To obtain magnetization characteristics of a d.c. shunt generator
2. To obtain load characteristics of a d.c. shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded
3. To obtain efficiency of a dc shunt machine using Swinburn’s test
4. To perform Hopkinson’s test and determine losses and efficiency of DC machine
5. To obtain speed-torque characteristics of a dc shunt motor
6. To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control
8. To study polarity and ratio test of single phase and 3-phase transformers
10. To obtain efficiency and voltage regulation of a single phase transformer by Sumpner’s test.
11. To obtain 3-phase to 2-phase conversion by Scott connection.
12. To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.
PEE-452: MICROPROCESSORS LAB

A. Study Experiments
1. To study 8085 based microprocessor system
2. To study 8086 and 8086A based microprocessor system
3. To study Pentium Processor

B. Programming based Experiments (any four)
4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
5. To develop and run a program for arranging in ascending/descending order of a set of numbers
6. To perform multiplication/division of given numbers
7. To perform conversion of temperature from 0 F to 0 C and vice-versa
8. To perform computation of square root of a given number
9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

C. Interfacing based Experiments (any four)
10. To obtain interfacing of RAM chip to 8085/8086 based system
11. To obtain interfacing of keyboard controller
12. To obtain interfacing of DMA controller
13. To obtain interfacing of PPI
14. To obtain interfacing of UART/USART
15. To perform microprocessor based stepper motor operation through 8085 kit
16. To perform microprocessor based traffic light control
17. To perform microprocessor based temperature control of hot water.

w.e.f. 2010-11
PEE-453: NETWORK LAB

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Note: Minimum eight experiments are to be performed from the following list.

1. Verification of principle of superposition with dc and ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3. Verification of Tellegen’s theorem for two networks of the same topology
4. Determination of transient response of current in RL and RC circuits with step voltage input
5. Determination of transient response of current in RLC circuit with step voltage input for
   under damp, critically damp and overdamp cases
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input
7. Determination of z and h parameters (dc only) for a network and computation of Y and
   ABCD parameters
8. Determination of driving point and transfer functions of a two port ladder network and verify
   with theoretical values
9. Determination of image impedance and characteristic impedance of T and II networks, using
   O. C. and S.C. tests Write Demo for the following (in Ms-Power point)
10. Verifcation of parameter properties in inter-connected two port networks: series, parallel and
    cascade also study loading effect in cascade.
12. To determine attenuation characteristics of a low pass / high pass active filters.

Note : College may add any three experiments in the above list.