COURSE OBJECTIVE: The purpose of this course is to:

1. Acquaint the student in the basic economic concepts and their operational significance and
2. Stimulate him to think systematically and objectively about contemporary economic problems.

UNIT-I

UNIT-II

UNIT-III
Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.

UNIT-IV
Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.
Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

UNIT-V
Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monoplistic Competition (Main features of these markets)
Supply and Law of Supply, Role of Demand & Supply in Price Determinition and effect of changes in demand and supply on prices.

UNIT-VI

Books Recommended:

TEXT BOOKS:

REFERENCE BOOKS:
1. A Text Book of Economic Theory Stonier and Hague (Longman’s Landon)
6. Indian Economy : Rudar Dutt & K.P.M. Sundhram

NOTE: Eight questions are to be set at least one question from each unit and the students will have to attempt five questions in all.
Part-A

Fourier Series and Fourier Transforms: Euler’s formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

Part-B

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula.

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series. Zeroes and singularities of complex functions, Residues. Evaluation of real integrals using residues (around unit and semi circle only).

Part-C


Testing of a hypothesis, tests of significance for large samples, Student’s t-distribution (applications only), Chi-square test of goodness of fit.
Linear Programming : Linear programming problems formulation, Solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

TEXT BOOKS :


REFERENCE BOOKS :

4. Probability and statistics for Engineers : Johnson. PHI.

Note: Examiner will set eight questions, taking two from Part-A, three from Part-B and three from Part-C. Students will be required to attempt five question taking at least one from each part.
**UNIT 1 CONDUCTING MATERIALS:**
Review of energy bands, description of materials, drift velocity, collision time, Mean free path, mobility, conductivity, relaxation time, factors affecting conductivity of materials, types of thermal conductivity, Wiedmann-Franz law, super conductivity, effect of magnetic field, conducting materials, applications.

**UNIT 2 DIELECTRIC MATERIALS:**
Behaviour of dielectric materials in static electric field, Dipole moments, Polarization, Dielectric constant, Polarizability, Susceptibility, mechanisms of polarization, behaviour in alternating field, dielectric loss, loss tangent, types of dielectric & insulating materials, electrostriction, Piezo-electricity, Applications.

**UNIT 3 MAGNETIC MATERIALS:**
Permeability, Magnetic susceptibility, magnetic moment, Magnetization, Dipole moment, types of magnetic materials, Magnetostriiction, eddy current & hysteresis losses, applications.

**UNIT 4 SEMICONDUCTORS:**
Review of Si and Ge as semiconducting materials, Continuity Equation, P-N junction, Drift & Diffusion, Diffusion & Transition capacitances of P-N junction.

**UNIT 5 CONSTRUCTION AND CHARACTERISTICS OF DEVICES:**
Brief introduction to Planar Technology for device fabrication., metal -semiconductor junctions (ohmic and non-ohmic), breakdown mechanisms in p-n junction, zener diode, electrical and optical excitation in diodes, LED, solar cells and photo-detectors.

**UNIT 6 BIPOLAR AND MOS DEVICES :**
BJT, UJT, JFET, MOSFETS

**UNIT 7 POWER DEVICES :**
Thyristor, Diac, Triac, GTO, IGBT, VMOS

**TEXT BOOKS:**
1. Electrical Engineering Materials: A.J. Dekker; PHI.
3. Electronic Devices & Circuits: Millman & Halkias; MGH.

**REFERENCE BOOKS:**

**NOTE :** Eight questions are to be set in all by the examiner taking at least one question from each unit. Students will be required to attempt five questions in all.
UNIT I  TRANSIENT RESPONSE :
Transient Response of RC, RL, RLC Circuits to various excitation signals such as step, ramp, impulse and sinusoidal excitations using laplace transform.

UNIT 2  NETWORK FUNCTIONS :
Terminal pairs or Ports, Network functions for one-port and two-port networks, poles and zeros of Network functions, Restrictions on pole and zero Locations for driving point functions and transfer functions, Time domain behavior from the pole-zero plot.

UNIT 3  CHARACTERISTICS AND PARAMETERS OF TWO PORT NETWORKS :
Relationship of two-port variables, short-circuit Admittance parameters, open circuit impedance, parameters, Transmission parameters, hybrid parameters, relationships between parameter sets, Inter-connection of two port networks.

UNIT 4  TOPOLOGY :
Principles of network topology, graph matrices, network analysis using graph theory.

UNIT 5  TYPES OF FILTERS AND THEIR CHARACTERISTICS :
Filter fundamentals, high-pass, low-pass, band-pass, and band-reject Filters.

UNIT 6  NETWORK SYNTHESIS :
Positive real functions, synthesis of one port and two port networks, elementary ideas of Active networks.

TEXT BOOKS:

REFERENCE BOOKS:
1. Introduction to modern Network Synthesis : Van Valkenburg; John Wiley
2. Network Analysis: Van Valkenburg; PHI
3. Basic circuit theory:Dasoer Kuh; McGraw Hill.
4. A Course in Electrical Circuit Analysis by Soni & Gupta; Dhanpat Rai Publication.

NOTE: Eight questions are to be set in all by the examiner taking at least one question from each unit. Students will be required to attempt five questions in all.
EE-205-E ELECTROMECHANICAL ENERGY CONVERSION

L T P CLASS WORK : 50
3 1 0 EXAM : 100
TOTAL : 150 DURATION OF EXAM : 3 HRS

UNIT 1 MAGNETIC CIRCUITS AND INDUCTION:
Magnetic Circuits, Magnetic Materials and their properties, static and dynamic emfs and force on current carrying conductor, AC operation of Magnetic Circuits, Hysteresis and Eddy current losses.

UNIT 2 PRINCIPLES OF ELECTROMECHANICAL ENERGY CONVERSION:
Force and torque in magnetic field system, energy balance, energy and force in singly excited magnetic field system, concept of co-energy, forces and torques in system with permanent magnets, dynamic equation.

UNIT 3 TRANSFORMERS:

UNIT 4 DC MACHINES:
Basic theory of DC generator, brief idea of construction, emf equation, load characteristics, basic theory of DC motor, concept of back emf, torque and power equations, load characteristics, starting and speed control of DC motors, applications.

UNIT 5 INDUCTION MOTOR:
Basic theory, construction, Phasor diagram, Equivalent circuit, Torque equation, Load characteristics, starting and speed control of induction motor, Introduction to single phase Induction motor and its applications, Fractional H.P. Motors, Introduction to stepper, servo reluctance and universal motors.

UNIT 6 SYNCHRONOUS MACHINES:
Construction and basic theory of synchronous generator, emf equation, model of generator, Phasor diagram, Regulation, Basic theory of synchronous motor, v-curves, synchronous condenser, applications.

TEXT BOOK:
1. Electrical Machines: Nagarath and Kothari; TMH

REFERENCE BOOKS:
1. Electrical Machines :P.S. Bimbhra; Khanna
2. Electrical Machines: Mukherjee and Chakravorti; Dhanpat Rai & Sons
3. Electrical Technology (Vol-II) : B.L Theraja; S. Chand.

NOTE: Eight questions are to be set in all by the examiner taking at least one question from each unit. Students will be required to attempt five questions in all.
Unit-1: Introduction to Data Structures: Definition of data structures and abstract data types, Static and Dynamic implementations, Examples and real life applications; The Stacks: Definition, Array based implementation of stacks, Linked List based implementation of stacks, Examples: Infix, postfix, prefix representation, Conversions, Applications.

Unit-2: Queues and Lists: Definition, Array based implementation of Queues / Lists, Linked List implementation of Queues / Lists, Circular implementation of Queues and Singly linked Lists, Straight / circular implementation of doubly linked Queues / Lists, Priority Queues, Applications.


Unit-5: Running time: Time Complexity, Big – Oh - notation, Running Times, Best Case, Worst Case, Average Case, Factors depends on running time, Introduction to Recursion, Divide and Conquer Algorithm, Evaluating time Complexity.


Heap sort: Heap Construction, Heap sort, bottom – up, Top – down Heap sort approach;

Searching Algorithms: Straight Sequential Search, Binary Search (recursive & non-recursive Algorithms)

Text Book:


Reference Books:

- Fundamentals of Data structures by Ellis Horowitz & Sartaj Sahni, Pub, 1983, AW
- Fundamentals of computer algorithms by Horowitz Sahni and Rajasekaran.
- Data Structures and Program Design in C By Robert Kruse, PHI,
- Theory & Problems of Data Structures by Jr. Synmour Lipschetz, Schaum’s outline by TMH
Note: Eight questions will be set in all by the examiners taking at least one question from each unit. Students will be required to attempt five questions in all.
LIST OF EXPERIMENTS:

1. To study V-I characteristics of diode, and its use as a capacitance.

2. Study of the characteristics of transistor in Common Base configuration.

3. Study of the characteristics of transistor in Common Emitter configuration.

4. Study of V-I characteristics of a photo-voltaic cell.

5. Study of characteristics of MOSFET/JFET in CS configuration.

6. To plot characteristics of thyristor.

7. To plot characteristics of UJT.

8. To plot characteristics of diac & Triac.

9. Study of loss factor in a dielectric by an impedance bridge.

10. Study of photo-resist in metal pattern for planar technology/PCB technology.

NOTE: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.
LIST OF EXPERIMENTS :

1. Transient response of RC circuit.

2. Transient response of RL circuit.

3. To find the resonance frequency, Band width of RLC series circuit.

4. To calculate and verify "Z" parameters of a two port network.

5. To calculate and verify "Y" parameters of a two port network.

6. To determine equivalent parameter of parallel connections of two port network.

7. To plot the frequency response of low pass filter and determine half-power frequency.

8. To plot the frequency response of high pass filter and determine the half-power frequency.

9. To plot the frequency response of band-pass filter and determine the band-width.

10. To calculate and verify "ABCD" parameters of a two port network.

11. To synthesize a network of a given network function and verify its response.

12. Introduction of P-Spice

NOTE: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.
<table>
<thead>
<tr>
<th>List of Experiments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To find turns ratio and polarity of a single phase transformer.</td>
</tr>
<tr>
<td>2. To perform open and short circuit tests on a single phase transformer.</td>
</tr>
<tr>
<td>3. To perform Sumpner's back to back test on single phase transformers.</td>
</tr>
<tr>
<td>4. Parallel operation of two single phase transformers.</td>
</tr>
<tr>
<td>5. Study of construction of a DC machine.</td>
</tr>
<tr>
<td>6. To plot O.C.C of a DC shunt generator and find its Critical Resistance.</td>
</tr>
<tr>
<td>7. To perform direct load test of a DC motor.</td>
</tr>
<tr>
<td>8. Speed control of a DC motor by armature control and field control methods.</td>
</tr>
<tr>
<td>9. To perform open circuit and block rotor tests of an induction motor.</td>
</tr>
<tr>
<td>10. Star-delta starting of a three phase induction motor.</td>
</tr>
<tr>
<td>12. To plot V-curve of a synchronous motor.</td>
</tr>
</tbody>
</table>

**NOTE:** Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.
LIST OF EXPERIMENTS:

1. Introduction of tools, electrical materials, symbols and abbreviations.
2. To study stair case wiring.
3. To study house wiring i.e., batten, cleat, casing-caping and conduit wirings.
4. To study fluorescent tube light.
5. To study high pressure mercury vapour lamp (H.P.M.V).
6. To study Sodium lamp.
7. To study repairing of home appliances such as heater, electric iron, fans etc.
8. To study construction of moving iron, moving coil, electrodynamic & induction type meters.
9. To design & fabricate single phase transformer.
10. To study fuses, relays, contactors, MCBs and circuit breakers.
11. Insulation testing of electrical equipments.
12. To design, fabricate a PCB for a circuit, wire-up and test.

NOTE: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution.