

M.D.UNIVERSITY, ROHTAK

# SYLLABUS OF APPLIED ELECTRONICS & INSTRUMENTATION ENGINEERING COURSE

3<sup>rd</sup> SEMESTER

ECONOMICS  
(COMMON FOR ALL BRANCHES)

HUM – 201 – E

L	T	P
3	1	-

Class Work: 50 Marks  
Theory: 100 Marks  
Total: 150 Marks  
Duration of Exam: 3 Hrs

### COURSE OBJECTIVE

The purpose of this course is to:

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

### UNIT-I

Definition of Economics - Various definitions; Nature of Economics Problems; Production possibility curve; Economic laws and their nature; Relationship between Science, Engineering, Technology and Economics.

### UNIT-II

Concepts and measurement of utility; Laws of Diminishing Marginal Utility; Law of equi-marginal utility; its practical application and importance.

### UNIT-III

Meaning of demand; Individual and Market demand schedules; 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 costs; Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost etc., in the short run and long run.

### UNIT-V

Meaning of Market and Types of Market. Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets). Supply and Law of Supply, Role of Demand & Supply in Price determination and the effect of changes in demand and supply of prices.

### UNIT-VI

Nature and characteristics of Indian economy; Brief and elementary introduction. Privatization and its meaning with merits and demerits. Globalization of Indian

economy, its merits & demerits. Elementary Concepts of VAT, WTO, GATE & TRIPS agreement.

## BOOKS RECOMMENDED

### TEXT BOOKS

1. Principles of Economics: P. N. Chopra; Kalyani Publishers.
2. Modern Economic Theory: K. K. Dewett; S. Chand & Co.

### REFERENCE BOOKS

1. A Text book of Economic Theory Stonier & Hague; Longman's Landon
2. Micro Economic Theory; M. I. Jhingan; S. Chand & Co.
3. Micro Economic Theory; H. I. Ahuja; S. Chand & Co.
4. Modern Micro Economics; S. K. Mishra, Pragati Publications
5. Economic Theory; A. B. N. Kulkarni & A. B. Kalkumdrikar; S. Chand & Co.,
6. Indian Economy; Rudar Dutt & K. P. M. Sundhram

Note: Eight questions are to be set atleast one question from each unit and the students will have to attempt five questions in all.

L	T	P
3	2	-

Class Work:	50 Marks
Exam:	100 Marks
Total:	150 Marks
Duration of Exam:	3 Hrs

### 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 (born 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. Limits 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

Probability Distributions and Hypothesis Testing: - Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.

Testing of hypothesis, tests of significance for samples, Student's t-distribution (applications only), test of goodness of fit.

Linear Programming: Linear programming problems formulation, Solving linear programming problems using (i) Graphical Method (ii) Simple Method (iii) Dual simplex method.

### TEXT BOOKS

1. Advanced Engg. Mathematics: F. Kreyszig
2. Higher Engg. Mathematics: B. S. Grewal

### REFERENCE BOOKS

1. Advance Engg. Mathematics: R.K. Jain, S.R.K. Iyenger
2. Advanced Engg. Mathematics: Michael D. Greenberg.
3. Operation Research: H. A. Taha
4. Probability and statistics for Engineers: Johnson, PHI.

Note: Examiner will set eight question, taking two from part-A, three from Part-B and three from Part-C. Students will be required to attempt five question taking atleast one from each part.

# ELECTRICAL ENGINEERING MATERIALS AND SEMI CONDUCTOR DEVICES

EE-201-E

L	T	P
3	1	-

Class Work: 50 Marks  
Exam: 100 Marks  
Total: 150 Marks  
Duration of Exam: 3 Hrs

## 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:

Behavior of dielectric materials in static electric field, Dipole moments, Polarization, Dielectric constant, Polarizability, Susceptibility, mechanisms of polarization, behavior 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, Magnetostriction, eddy current & hysteresis losses, applications.

## UNIT 4: SEMI CONDUCTORS:

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, PIII.
2. Solid State Electronic Devices: Street Man & Banerjee; Pearson.
3. Electronic Devices & Circuits: Millman & Halkias; MGH.

## REFERENCE BOOKS

1. Electrical Engineering Materials: S.P. Seth & P. V. Gupta; Dhanpat Rai.
2. Text Book of Power Electronics: H. C. Rai, Galgoitia Publications.
3. Electronic Devices & Circuit Theory: Boylestad & Nashelsky; Pearson.
4. Semiconductor Devices : Jaspreet Singh; John Wiley.

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.

## NETWORK THEORY

L	T	P
3	1	-

Class Work: 50 Marks  
Exam: 100 Marks  
Total: 150 Marks  
Duration of Exam: 3Hrs

### UNIT 1: 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:

Terminals pairs of 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 parameters 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:

1. Network Analysis & Synthesis: Umesh Sinha; Satya Prakash Publications.
2. Network Analysis & Synthesis: F.F.Kuo; John Wiley & Sons Inc.

### REFERENCE BOOKS:

1. Introduction to Modern Network Synthesis: Van Valkenburg, John Wiley & Sons Inc.
2. Network Analysis: Van Valkenburg; Prentice Hall Inc.
3. Basic circuit theory: Dasoer Kuh; McGraw Hill.
4. A course in Electrical Circuit Analysis by Soni & Gupta; Dhanpat Rai Publication.
5. Circuit Analysis: G. K. Mithal; Khanna Publication.
6. Networks and Systems: D Roy Choudhary; New Age International.

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.

# ELECTROMECHANICAL ENERGY CONVERSION

EE-205-E

L	T	P
3	1	-

Class Work: 50 Marks  
Exam: 100 Marks  
Total: 150 Marks  
Duration of Exam: 3Hrs

## 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

Basic theory construction operation at no-load and full-load; Equivalent circuit; Phasor diagram; Open Circuit and Short Circuit tests for parameters determination; Efficiency and regulation; Auto-transformers; Introduction to three-phase transformer; Current and Potential Transformers; Principle, construction, analysis and applications of CTs and PTs.

## 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, 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; The emf equation; Model of generator; Phasor diagram. Regulation. Basic theory of synchronous motor; V-curves; Operation as synchronous condenser; Applications.

### TEXT BOOK:

1. Electrical Machines: Nagarath and Kothari; Tata McGraw Hill

### REFERENCE BOOKS:

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

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.

DATA STRUCTURES & ALGORITHMS  
(CSE, EL, IT, EI)

CSE-201 E

L	T	P
3	1	-

Class Work: 50 Marks  
Exam: 100 Marks  
Total: 150 Marks  
Duration of Exam: 3Hrs

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 double linked Queues/Lists, Priority Queues, Applications.

Unit 3: Trees: Definition of trees and Binary trees, Properties of Binary trees and Implementation, Binary Traversal pre-order, post order, In-order traversal, Binary Search Trees, Implementations, Threaded trees, Balanced multi way search trees, AVL Trees, Implementations.

Unit 4: Definition of Undirected and Directed Graphs, implementation of graphs, Adjacency matrix, path matrix implementation, The Linked List representation of graphs, Shortest path Algorithm, Graph Traversal-Breadth first Traversal, Depth first Traversal, Tables: Definition, Hash Function, Implementations and 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.

Unit 6: Sorting Algorithms: Introduction, Sorting by exchange, selection, insertions: Bubble sort, Straight selection sort, Efficiency of above algorithms; Shell sort, Performance of shell sort, Merge sort, Merging of sorted arrays & Algorithms; Quick sort Algorithms analysis.

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 Books:

- Data Structures using C by A.M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub.

Reference Books:

- Data Structures and Algorithms by A.V.Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison Wesley, 1999, Low Priced Edition.
- Fundamentals of Data structures by Ellis Horowitz / & Sartaj Sahni, Pub, 1983,1983, 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. Seymour Lipschitz/ Schaum's outline by T.M.H.
- Introduction to Computers Science – An algorithms approach, Jean Paul Tremblay, Richard B Bunt 2002, T.M.H.
- Data Structure and the Standard Template library – William J. Collins, 2003, T.M.H.

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.

# ELECTRICAL ENGINEERING MATERIALS AND SEMICONDUCTOR DEVICES LAB

EE-221-E

L	T	P
0	0	2

Class Work: 25  
Exam: 25  
Total: 50  
Duration of Exam: 3 Hrs

## LIST OF EXPERIMENTS:

1. To study V-I characteristics of diode, and its use as a capacitance.
2. To study of the characteristics of transistor in Common Base configuration.
3. To study of the characteristics of transistor in Common Emitter configuration.
4. To study of V-I characteristics of a photovoltaic cell.
5. To study of characteristics of MOSFET/JFET in CS configuration.
6. To plot characteristics of a thyristor.
7. To plot characteristics of UJT.
8. To plot characteristics of the Diac & Triac.
9. Study of loss factor in a dielectric by an impedance bridge.
10. Study of photo resistant in material 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 of designed & set by the concerned institution as per the scope of the syllabus.

## NETWORK THEORY LAB

EE-223-E

L	T	P
0	0	2

Class Work: 25  
Exam: 25  
Total: 50  
Duration of Exam: 3Hrs

### LIST OF EXPERIMENTS:

1. Transient response of R-C circuit.
2. Transient response of R-L circuit.
3. To find the resonance frequency, Band width of R-L-C 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 parameters 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 PSPICE.

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.

## ELECTROMECHANICAL ENERGY CONVERSION LAB

EE-225-E

L	T	P
0	0	3

Class Work:	25
Exam:	25
Total:	50
Duration of Exam:	3Hrs

### LIST OF EXPERIMENTS:

1. To find turns ratio and polarity of a single-phase transformer.
2. To perform open and short circuit tests on a single-phase transformer.
3. To perform Sumpner's back-to-back test on single-phase transformers.
4. Parallel operation of two single-phase transformers.
5. Study and construction of a DC machine.
6. To plot O.C.C. of a DC shunt generator and find its Critical field Resistance.
7. To perform direct load test of a DC motor.
8. Speed control of a DC motor by armature control and field control methods.
9. To perform the open circuit and block rotor tests of an induction motor.
10. Star-delta starting of a three-phase induction motor.
11. Plot O.C.C. of a synchronous generator.
12. To plot V-Curve of a synchronous motor.

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.

## ELECTRICAL WORKSHOP

EE-231-E

L	T	P
0	0	2

Class Work: 25  
Exam: 25  
Total: 50  
Duration of Exam: 3Hrs

### 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-capping and conduit wirings.
4. To study fluorescent tube light.
5. To study high pressure Mercury Vapor 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, electro-dynamic & induction type meters.
9. To design & fabricate single-phase transformer.
10. To study fuses, relays, contractors, 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.