

## SCHEME OF INSTRUCTION & EXAMINATION

### B.E II YEAR (REGULAR)

#### (ELECTRONICS & COMMUNICATION ENGINEERING)

#### SEMESTER - I

Sl. No.	Syllabus Ref.No	SUBJECT	Scheme of Instructions		Scheme of Examination		
			Periods per Week	L/T D/P	Duration in Hrs	Maximum Marks	Univ. Exam
<b>THEORY</b>							
1.	MAT 201	Mathematics-III	4	-	3	75	25
2.	EC 201	Basic Circuit Analysis	4	-	3	75	25
3.	EC 202	Electromagnetic Theory	4	-	3	75	25
4.	EC 203	Electronic Devices	4	-	3	75	25
5.	EE 222	Electrical Technology	4	-	3	75	25
6.	ME 221	Elements of Mechanical Engineering	4	-	3	75	25
<b>PRACTICALS</b>							
1.	EC 231	Electronics Devices - I Lab	-	3	3	50	25
2.	EC 232	Electronic Workshop Lab	-	3	3	50	25
<b>TOTAL</b>			<b>19</b>	<b>16</b>	<b>-</b>	<b>550</b>	<b>225</b>

## **MAT201**

### **MATHEMATICS-III**

Instructions	4 Periods per Week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

#### **UNIT-I**

Partial differential equations: Formation of partial-differential equation of first order-Languages solution. Standard types-Charpit's method of solution-partial differential equations of higher order Monge's method.

#### **UNIT-II**

Fourier Series: Expansion of a function in Fourier series for a given range-half range sine and cosine expansion-odd and even functions of Fourier series – change of interval.

#### **UNIT-III**

Partial differential equations: Solution of wave equation, heat equation and Laplace's Equation by the method of separation of variable and their use in problems of vibrating string, one dimensional unsteady heat flow and two dimensional steady state heat flow .

#### **UNIT-IV**

Laplace transformation: Laplace of transform-inverse Laplace transform- properties of Laplace transforms-Laplace transforms of unit step function, impulse function and periodic functions-convolution theorem –solution of ordinary differential equation with constant coefficients using Laplace Transform

#### **UNIT-V**

Numerical Methods: Solution of simultaneous, linear equations. Gauss elimination method and ill conditional equations and refinement of solutions. Gauss seidel and Iterative method .Numerical differentiation and integration. Solution of differential equations .Runge-Kutta Method-Predicator-corrector method.

#### **Suggested Reading:**

1. Kreyszig E, Advance Engineering Mathematics, Wiley Eastern Ltd., New Delhi, 1976.
2. R.K.Jain & S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publications, 2002.
3. A.K.Mukhopadhyay, Mathematical Methods of Engineer and Physicists, Wheeler Publishing, 2002.
4. Narayanan Pilay & Ramaniah, Advanced Mathematics for .Engineering Students Volume-III, S.Chand & Co., New Delhi, 1980.

## **EC201**

### **BASIC CIRCUIT ANALYSIS**

Instruction	4 periods per week
Duration of University Examination	3 Hours

University Examination	75 Marks
Sessional	25 Marks

### **UNIT-I**

Lumped circuit elements, dependent and independent current and voltage sources, Ohm's Law, energy power, Kirchoff's laws, D.C circuit analysis. Nodal and mesh analysis, Source transformations, Thevenin's and Norton's theorems, Superposition theorem, Maximum power transfer theorem.

### **UNIT-II**

Linear time invariant first order and second order circuits, Formulation of integro differential equations, RL, RC and RLC circuits, transient and steady state responses, Zero Input Response (ZIR), Zero state Response (ZSR)- complete response.

### **UNIT-III**

Stead state response of RLC networks to exponential signals, Sinusoidal function, response to sinusoidal excitation, phasors, impedance and admittance. Analysis of magnetically coupled circuits. Calculation of power in a.c circuits, average power, apparent power, complex power, vector representation.

### **UNIT-IV**

Concept of complex frequency, impedance and admittance functions, pole-zero cancellation, calculation of response from pole zero plot. Series and parallel resonance, Q-factor, selectivity, bandwidth. Calculation of Q factor for different resonant forms.

### **UNIT- V**

Topological description of networks. Network graphs, tree, chord, cutset, incidence matrix, tieset matrix, cutset matrix, Formulation of node and loop equations. Tellegen's theorem, duality, dual networks.

### **Suggested Reading:**

1. Hayt Jr W.H Kemmerly J.E Engineering Circuit Analysis, 5<sup>th</sup> Edition, McGraw Hill, 1993
2. Aarte, V.K Network Theory and Filter Design, 2<sup>nd</sup> Edition, New Age International Pvt. Ltd., 1986.

## **EC202**

### **ELECTROMAGNETIC THEORY**

Instruction	4 periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

### **UNIT-I**

Cartesian, Cylindrical and spherical coordinate systems-review of vector analysis – coulomb's Law. Electric Field intensity. Electric field due to different charge distributions. Line of charge,

Sheet of charge and volume charge distributions. Electric flux density, Gauss's Law and application. Divergence theorem.

#### **UNIT-II**

Energy and potential, potential Field of system of charges, potential gradient. Energy density, Boundary conditions in static electric field, Capacitance of two-wire line, Continuity equation, current density, Poisson's equation, Laplace equation, Uniqueness theorem, Applications of simple practical cases.

#### **UNIT-III**

Steady magnetic field, Biot- savart's law, Ampere's law, Stroke's Theorem , Magnetic scalar and vector potentials. Magnetic boundary conditions, Magnetomotive force, Permeability, self and mutual inductances, Evaluation of inductance of solenoid, toroid, coaxial cable, two- wire transmission line.

#### **UNIT-IV**

Time varying fields, Maxwells equations, Boundary conditions in Em field. Em wave equations in free space and conductors. Sinusoidal variations. Uniform plane wave, wave motion in free space. Wave motion in perfect dielectrics, lossy dielectric and conductors. Polarization- linear, elliptical and circular polarization.

#### **UNIT-V**

Energy theorem and pointing vector, Instantaneous, average and complex pointing vector. Reflection of plane waves by a perfect conductor, normal and oblique incidence. Reflection of plane waves by a perfect dielectric, normal and oblique incidence. Reflection coefficient. Transmission coefficient, power and energy calculations.

#### **Suggested Reading:**

1. Jordan,E.C Balmain,K.G Electromagnetic waves and Radiating Systems,2<sup>nd</sup> Edition,prentice Hall of India,2001.
2. Hayt. W.H Engineering Electromagnetic, Tata McGraw Hill, 5<sup>th</sup> Edition 1994.

#### **Additional Reading:**

1. J.D. Krauss and K.R. Carver, Electromagnetic Fields, McGraw Hill, ISE.
2. J.D Krauss and Fleish, Electromagnetic with application, 5<sup>th</sup> Edition, McGraw Hill, 1999.

### **EC203**

### **ELECTRONIC DEVICES**

Instruction	4 periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

#### **UNIT-I**

Electron Ballistics: Motion of charged particles in uniform electric, magnetic field, combined electric and magnetic fields, magnetic focusing. Construction of CRT-Electron gun & electrode potentials, electric and magnetic deflection systems and their sensitive. Comparison of electric

and magnetic deflection and their applications, block schematic of CRO and its working. Applications of CRO.CRO probes.

### **UNIT-II**

Junction Diode: Different types of PN Junction formation techniques. PN junction characteristics, biasing – band diagrams and current flow. Diode current equations under forward bias and reverse bias conditions. Junction Breakdown in diodes and breakdown voltages. Effect of temperature on diode characteristics. Diode as a circuit element. Small signal diode models. Junction capacitance under forward bias and reverse bias. Diode switching characteristics, Zener diodes.

PN Diode Applications: Peak Inverse Voltage requirements of diodes for Half-Waves , full-wave and Bridge rectifiers- their performance characteristics. Analysis and design of Rectifiers with and without filters(L,C,LC AND  $\pi$  Filters).

Special Diodes: Elementary treatment on the functioning of Tunnel / Backward, Varactor, Photo, Light Emitting diodes, Liquid Crystal Display.

### **UNIT-II**

Bipolar Junction Transistors(BJT): Transistor junction formation( collector – Base, base- emitter junctions ). Transistor junction biasing band diagram for NPN & PNP transistor, Current components & current flow in BJT, and Ebers – Mole Equations, large and signal current gains. Modes of transistor operation, common base input, output characteristics. Early effect, Early voltage from CE output characteristics,CE & CC- input/output characteristics, BJT as an amplifier, BJT biasing techniques, Thermal runaway & heat sinks and thermal stabilization. The operating point stabilization against temperature and device variations-current stability factor ( $s_1$ ),  $S_v$ ,  $S_\beta$  and their interrelation with  $S_i$  feedback and compensation techniques. Bias design for a specified output swing.

Small signal transistor equivalent circuit: Small signal low – frequency h-parameter model of BJT. Determination of H-parameters. Analysis of BJT amplifier using h-parameters. Comparison of CB,CE and CC amplifier configurations.Analysis of BJT amplifiers with approximate model.

Special Devices: Working of UJT SCR, DIAC, TRIAC and CCD.

### **UNIT-IV**

Junction Field Effect Transistors (JFET) : JFET formation, operation & current flow, pinch-off voltage, V- I characteristics of JFETS. JFETS biasing – zero current drift biasing, biasing against device variations. Low frequency small signal model of FETs.

Analysis of CS,CD and CG amplifiers and their comparison. FET as on amplifier and as a switch.

MOSFETS: MOSFETs, Enhancement & Depletion mode MOSFETs , V-I characteristics. MOSFET as a resistance Biasing of MOSFTs, MOSFET as a switch, CMOS circuit and CMOS and a low frequency amplifier.

### **UNIT-V**

BJT and FET and high frequencies: The high frequency T – Model Alpha cutoff frequency. Beta cut-off frequency,  $f_t$ . Transmission line analogy & Hybrid -  $\Pi$  equivalent circuit of CE configuration. Hybrid  $\Pi$  parameters in terms of h-parameters.High frequency equivalent circuit of FETs. Gain-bandwidth product of BJT & FETs.

### **Suggested Reading:**

1. Jacob milliman & Christos C. Halkais : Electronic Devices & Circuits, McGraw Hill 1991.

2. Millman.J.. Grabel.A Micro Electronics,2<sup>nd</sup> Edition, 4<sup>th</sup> reprint, Tata McGraw Hill,Edition 1999.
3. Mathur, S.P. Kulsreshtra ,D.C Chandra P.R Electronic Devices, Applications and Integrated Circuits ,5<sup>th</sup> Edition , Umesh Publications 1986.
4. Ben G.Streetmen, Solid state electronic devices, Prentice Hall, India.

**Additional Books:**

1. LeCroissitte D. Transistors, prentice-hall India.
2. S.Shalivahanan, N.Suresh Kumar, A. Valluva Raj : Electric Devices & Circuits :Tata McGrawHill, 2003.
3. S.C Sarkar : Electronic Devices & Circuits-I : Everest publications House,2001.
4. J.B Gupta: Electronic Devices & Circuits: S.K Kataria & Sons , 2002.

**EE222**

**ELECTRICAL TECHNOLOGY**

Instruction	4 periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

**UNIT-I**

D.C. Machines: Constructional details – Simple lap wave windings- Methods of excitations – induced emf –Basic ideas of armature reaction and commutation – characteristics of shunt, series and compound generators and applications.

DC Motors : Torque developed in motor starter – Characteristics of shunt, series and compound motors –speed control of DC motors.

**UNIT-II**

Balanced three phase system – Star delta connection – Relationship between line and phase quantities – Measurement of power by two wattmeters method.

A.C Generators: Construction – emf equation – armature reaction Synchronous impedance Regulation.

**UNIT-IV**

Induced motors: Construction – production of rotating magnetic field – slip torque characteristics – starters of cage and wound rotor induction motors. Single phase induction Motors: Construction – theory of operations: Characteristics of shaded pole,split phase and capacitor motors-applications .solid state drives-thyristor as control element- introduction to speed control of motor using thyristors.

**UNIT-V**

Power Systems: Basic idea of thermal, hydro nuclear and non- conventional generating systems and layout – block schematic of power systems – transmission using high voltages- advantages – basic ideas of line parameters – short line calculators – elementary ideas of distribution – protection of power system using relays and circuit breakers(elementary ideas only).

**Suggested Reading:**

1. H.Cotton Electrical Technology, BI Publications, 1985.
2. M.Ram Murthy , Thyristors and their applications, East west Publications ,1977.
3. M.L Soni, PV Gupta and VS Batnagar, A course in Electrical power, Dhanapat Rai and Sons ,Delhi,1995.

**ME221**

**ELEMENTS OF MECHANICAL ENGINEERING**

Instruction	4 periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

**UNIT-I**

Thermodynamics: Concepts of system, process and properties. Laws of thermodynamics, concept of energy and clausius inequality, steady flow energy equation for an open system, conditions of reversible and irreversible process. Calculation of change in Internal Energy, Enthalpy, Entropy and Work done.

IC Engines: Concept of Air Standard cycles, Otto, Diesel and Dual Combustion cycle. Working of Four stroke and Two stroke, petrol and Diesel Engines. Valve timings diagram, Calculation of Indicated power, Brake power, Specific Fuel consumption, Mechanical and Thermal efficiencies.

Reciprocating Air Compressors: Single stage and multistage compressors, workdone, efficiency of multistage compressors, Effect of clearance Volume.

**UNIT-II**

Heat Transfer: Basic modes of heat transfer, Fourier's law of conduction, Newton's law of cooling and Stefan-Bolzman's law of Thermal radiation. One dimensional steady stage conduction heat transfer through plane walls and hollow cylinders with and without heat generation. Critical radius and insulation.

Radiation: Absorptivity, Reflectivity and Transmittivity. Concept of black body and emissivity. Kirchoff's Law, Lambert cosine law, plank and Wein's laws. Monochromatic and total emissive power.

Heat Exchanges: Classification and applications of heat exchanges in industry. Derivation of LMTD in parallel flow and counter flow heat exchanges and problems.

**UNIT-III**

Refrigeration: Types of Refrigeration systems- Air Refrigeration system, Vapour compression system, vapour Absorption system, Stream jet refrigeration system, thermoelectric refrigeration system. Working of Bell coleman air refrigeration system and simple vapour compression cycle for vapour compression system. COP and representation of cycle on T-S,P-H and H-S diagrams. Types and properties of refrigerants.

Air Conditioning: Human comfort, components of air conditioning equipment, parameters, and Psychrometric process and load calculations.

**UNIT-IV**

Basic Manufacturing process: Welding, Brazing and Soldering, brief description of processes, parameters and associated principles, applications of Gas welding and welding and importance of fluxes.

Casting: Sand Casting, die casting and principles and applications.

Forming: Basic concepts of forming process- Rolling, Wire drawing. Machine processes:

Turning, Drilling and Shaping.

#### **UNIT-V**

Definitions of link, pair, Kinematics chain mechanism and machine. Inversions of slider crank, double slider crank chains.

Gears: classifications of gears Spur Gears: Types of motion, Nomenclature, Law of gear tooth action, involutes as a gear tooth profile, interference of involute gears, minimum number of teeth to avoid interference.

Helical and Bevel Gears: Gear tooth actions and contact conditions.

Worm Gears: Calculations of speed ratio

Gear Trains: Simple, Compounded, reverted and epicyclic gears trains.

Belt and Rope drives: Open and Crossed belt drives. Length of belt. Ratio of tensions.

#### **Suggested Reading:**

1. Hajra vhoudary, "Elementary of workshop technology" Vol I & II, Asian publications 1993.
2. Thomas Bevan, "Theory of Machines", CBS publishers, 1995.
3. P.L Ballancey, "Thermodynamics", Khanna Publishers.
4. S.S Ratan, "Theory of Machines", Tata -McGraw Hill Publications, 1995.

#### **EC231**

#### **ELECTRONIC DEVICES LAB**

Instruction	3 periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

Special note: (i) Sessional marks are to be awarded as per the following breakup

- (a) 15 marks for the regular lab exercises
- (b) 10 marks for the Mini project cum design exercise(s)

(ii) A total of not less than 15 experiments must be carried out during the semester. (Wherever possible more than 1 lab experiment should be carried out in one lab session of 3 periods per week)

#### **(a) Regular Lab Experiments:**

1. Measurement of Resistivity of semiconductor samples during 4-probe method.
2. Hall Effect Measurements.
3. Design, realization and performance evaluation of half wave & full wave rectifiers.
4. Design and performance evaluation of half wave and full wave rectifiers with capacitance input, LC & Filters
5. Plotting the characteristics of CB, CE & CC configurations of BJTS

6. Plotting the characteristics of CG, CS configurations of FETs
7. BJT and FET Biasing
8. Measurement of Transistor h-parameters in Common Emitter Configuration
9. Characteristics of special devices-UJT, SCR, Tunnel diode
10. Characteristics of zener diode, photo diode, photo transistor
11. Driving LEDs, Seven segment LED/LCD displays
12. Common Emitter Transistor Amplifier
13. FET Common source Amplifier
14. Analysis & Design of circuits using PSPICE

**(b) Mini Project cum Design Exercise(s)**

To design and realize a rectifier with a specific type of filter for a specified DC voltages, load current, ripple factor and load characteristics

**General Note:**

- (i) There should not be more than 2 students per batch while performing any of the lab experiment
- (ii) Mini Project cum design exercise(s);
  - (a) The Students must design, rig-up and test the circuits wherever possible and should carryout the experiments individually
  - (b) This exercise carries Sessional marks of 10 out of 25, while the remaining 15 marks are for the remaining lab exercises.

**EC232**

**ELECTRONIC WORKSHOP LAB**

Instruction	3 periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

Special note: (i) Sessional marks are to be awarded as per the following breakup

- (c) 15 marks for the regular lab exercises
- (d) 10 marks for the Mini project cum design exercise(s)

(ii) A total of not less than 15 experiments must be carried out during the semester. (Wherever possible more than 1 lab experiment should be carried out in one lab session of 3 periods per week)

**(c) Regular Lab Experiments:**

- 1-2. Study of (with reference to typical electromechanical specifications, circuit representation): Electronic components(all types of discrete Active & Passive device, display devices, integrated components/circuits with their packing etc.), electro mechanical components(switches, sockets, connectors etc.) electromagnetic

- components(coils-different types of magnetic and ferrite cored, potted components relays etc.)
3. Study and use of different meters (moving coil, moving iron, colt/ammeter, AVO /Multimeter) for the measurement of electrical parameters.
  4. Measurement of RLC components using LCR Meter
  5. Study of CRO & Measurement of voltage, frequency and Phase Angle
  6. Design and fabrication (winding) of an iron cored inductance coil for a given value of L, current and core specifications. Measurements of their functional electrical parameters.
  7. Design of AC mains operated step down transformer Winding for a given turns ratio, current ratings and core specifications. Measurements of their functional electrical parameters.
  8. PCB design of a small circuit with its layout using tapes & etching in the lab
  9. Comparison of different semiconductors diodes and transistors w.r.t their specifications and applications.
  10. Soldering & de-soldering Exercises using discrete components & ICs for a specific circuit requirement

**(d) Mini Project cum Design Exercise(s)**

11-13: Design of a double-sided PCB for a complex circuit(comprising of discrete components & ICs)- and generating the PCB Artwork(Design using PCB design software) and getting the same fabricated in a PCB making providing the artwork designed.

14-15: Assembly and testing of a circuit from a commercially available kit.

**Suggested Reading:**

1. Zbar, P.B. Basic Electronics. A Text-Lab Manual, 7<sup>th</sup> edition, Tata McGraw Hill, 1995

**General Note:**

- (i) There should not be more than 2 students per batch while performing any of the lab experiment
- (ii) Mini Project cum design exercise(s);
  - (a) The Students must design, rig-up and test the circuits wherever possible and should carryout the experiments individually
  - (b) This exercise carries Sessional marks of 10 out of 25, while the remaining 15 marks are for the remaining lab exercises.

