

VEER NARMAD SOUTH GUJARAT UNIVERSITY

B.E.-II (Electronics Engg.)

B.E.III (Electronics) 4 th Semester		Teaching Scheme			Examination Scheme						
					Theory Exam University Exam.		Practical/Quiz/Viva/T.W. etc.				
							University Exam.	Tutorial	Cont. Evaluation	Total Marks	
Course	Course No.	L Hrs.	T Hrs.	P Hrs.	Duration Hrs.	Marks	Duration Hrs.	Marks			
Electrical Network-II	ELE 401 EC	3	1	0	3	100	-	-	25	-	25
Electrical Measuring Instruments	ELE 402 EC	3	0	2	3	100	3	30	-	20	50
Solid State Devices	EC 403 EC	3	0	2	3	100	3	30	-	20	50
Electronic Circuits	EC 404 EC	2	1	2	3	100	3	30	25	20	75
Digital Circuits	EC 405 EC	3	1	2	3	100	3	30	25	20	75
Electromagnetic	EC 406 EC	3	1	0	3	100	-	-	25	-	25
TOTAL :		18	4	8	-	600	-	120	100	80	300
Total Contact Hours : 30 Total Marks : 900											

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Semester - IV

ELE 401 EC Electrical Networks II

1. Graph Theory and its Applications : Fundamental concepts, definitions of a graph and various related terms, paths and circuit connections, tree of a graph, cut sets and tie sets, non separable planar and dual graphs, matrices of oriented graphs, properties and inter relationships of incidence, tie set and cut set matrices, complete circuit analysis using tie set and cut set matrices

Circuit Transients : review of d.c. transients; R-L, R-C and R-L-C sinusoidal transient analysis using Laplace transform methods, two mesh a.c. transients, initial and final value theorems and S-domain circuits.

Symmetrical Components : review of analysis of polyphase unbalanced networks, theory of symmetrical components, its applications to the analysis of various polyphase unbalanced circuits.

Network Functions and Two port parameters: Poles and zeros of a function, physical and analytical concepts, terminals and terminal pairs, driving point immittances, transfer functions, restrictions on locations of poles and zeros in S-plane. Time domain behaviour from pole zero locations in the S plane. Procedure for finding network functions for general two terminal pair network, transfer immittances, two port and N-port networks, Ladder, Lattice, Pie, and Tee networks, Image parameters, definitions, calculations and interrelationships of impedance, admittance, hybrid, and transmission line parameters for two port networks.

Sinusoidal Steady State Analysis: Radian Frequency and sinusoid, magnitude and phase of network functions, sinusoidal network functions in terms of poles and zeros, resonant circuits, bandwidth and circuit Q, asymptotic change of magnitude and phase of network functions in light of poles and zeros, polar plots of network functions, analysis and applications of symmetrical lattice network.

One terminal Pair Reactive Networks: Reactive networks and their properties, (only conceptual) external and internal critical frequencies, four reactive function forms on the basis of external critical frequencies, specifications for reactive functions, Foster and Cauer forms of reactive functions, use of normalized frequency, choice of network realization, separation property for reactive functions and its proof,

Two Terminal Pair Reactive Networks (Filters): Ladder network and its decomposition into tee, pie, and L sections, image impedance, image transfer function and applications to L-C networks, attenuation and phase shift in symmetrical Tee and Pie networks, constant K-filters, m-derived filters, composite filters, problem of termination, lattice filters, Bartlett's bisection theorem, (without proof).

REFERENCE:

- Balabanian & others: Electrical network theory, John Wiley.
- Van Valkenberg: Network Synthesis, Asia Publishing.
- Soni & Gupta: Course in Circuit analysis, Dhanpat Rai.

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Semester – IV

SOLID STATE DEVICES : EC 403 EC

ENERGY BANDS IN SOLIDS : Charged particles - Field effect intensity, Potential energy - The eve units of energy – Nature of atom. Electronic structure of elements - Energy band theory of crystals. Lattice structure of crystals.

TRANSPORT PHENOMENA IN SEMICONDUCTOR : Mobility and conductivity; Properties of intrinsic P and N type semiconductors; Mass action law-conductivity modulation; Thermistors; Generatio and recombination of charges; Diffusion current; continuity equation; Injection minority carrier charges; Potential variation within a graded semiconductor.

JUNCTION DIODE CHARACTERISTICS : PN junction as rectifier; Current component in a pn diode; Volt ampere characteristics; Temperature dependence; Transition capacitance; Varactor diodes; diffusion capacitance; Junction diode switching times; Characteristics of breakdown diodes; Tunnel diode and negative resistance region.

BIPOLAR JUNCTION TRANSISTOR CHARACTERISTICS : Transistor current components; Static characteristic and parameters; Transistor configuration; Early effect; Ebers moll model; Maximum voltage rating.

JFET, MOSFET, MOS INTEGRATED DEVICES & TECH. : Construction; Pinch off Voltage Derivation; MOSFET characteristics Ion Implantation Tech., MOSFET as an Inverter; CMOS as an Inverter; CMOS as an Inverter; CCD (Charge Coupled Device); Input protection in MOSFET.

POWER ELECTRONIC DEVICES : Construction and characteristics of SCR; Applications as HWR and FWR; Principle of operation and characteristics of DIAC and TRIAC; UJT and Applications; Use of UJT as a relaxation Oscillator.

OPTOELECTRONIC DEVICES : Principle of operation and characteristics of Photoconductive; Photovoltaic and Photoemissive sensors and light emitters; Photodiode; Photodetectors; Phototransistors; Solarcell construction and characteristics; And Applications; LED characteristics; LED Eye Response Curve and Geometries and applications; Optoisolators.

INTEGRATED CIRCUITS AND DEVICES : Introduction of IC families; Fabrication Steps and evolving transistor; Diode and Resistor; capacitor families.

REFERENCES :

1. MILLMAN & HALKIES : INTEGRATED ELECTRONICS, McGRAW HILL, 9TH REPRINT, 1995.
2. MOTTERSLED : ELECTRONICS DEVICES AND COMPONENTS, PITMAN, 1993.
3. STREETMAN : SOLID STATE DEVICES, PHI, 4TH EDITION, 1995.
4. M. S. TYAGI : SEMICONDUCTOR DEVICES & CIRCUITS, JOHN WILEY & SONS, 1992.
5. BOYLSTED & NASHESKY : ELECTRONIC DEVICES & CIRCUITS THEORY, PHI, 1993.

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ELECTRONIC CIRCUITS : EC 404 EC

FET : Introduction to theory and operations of n-channel JFET & MOSFET; Reversibility of drain & source; P-channel FET; FET switch; MOSFET inverter; Bias stability in FET; Different FET configuration; Small signal analysis of FET.

FREQUENCY RESPONSE : R-C, Coupled amplifier with BJTs; Effect of emitter bypass capacitor; Coupling capacitor of base and collector; Low frequency analysis of FET amplifier; Source bypass capacitor; Drain coupling capacitor and gate coupling capacitor.

HIGH FREQUENCY ANALYSIS OF TRANSISTOR AMPLIFIER : Transistor amplifier at high frequencies; Hybrid π equivalent circuit at high frequency; High frequency behaviour of CE & CC amplifier; FET at high frequencies; CD and CS amplifier at high frequency; GBW products of above circuits.

NEGATIVE FEEDBACK IN AMPLIFIERS : Basic concept of feedback amplifier; Effect on gain due to feedback; Input and output impedances; Feedback amplifiers and sensitivity function; Voltage series, voltage shunt, current series and current shunt configuration circuits; Details analysis and introduction to its design; Frequency response of a feedback amplifier.

OSCILLATORS : Barkhausen's criteria for oscillators; Stability concept; Three pole amplifier; Nyquist criteria; Stabilizing networks; Frequency compensation and sinusoidal oscillator; Phase shift, Wien bridge, Colpitts, Hartley, Crystal and Tune circuit type oscillators (AF & RF Range).

TUNED AMPLIFIER : Introduction to single tuned amplifier; G.B.W. response calculations & design; Cascade amplifier; Neutralization methods; Synchronously tuned amplifier; Elementary treatment of stagger tuned and doubly tuned amplifiers.

REFERENCE :

1. SCHILLING & BELOVE : Electronic Circuits - Discrete and Integrated, McGraw Hill Publication, 3rd edition 1989, reprint 1994.
2. MILLMAN & HALKIAS : Integrated Electronics, McGraw Hill Publication, 1992
3. MILLMAN & GRABEL : Micro Electronics, McGraw Hill Publication, 1992.
4. BOYLESTAD & NASHLESKY : Electronic Devices & Circuit Theory, 5th edition PHI, 1992, Ninth reprint 1995.

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DIGITAL CIRCUITS : EC 405 EC

NUMBER SYSTEMS : Decimal number system; Binary, octal and hexadecimal number systems; Conversion from one number to another number system; Addition, subtraction, multiplication and division using different number systems; Representation of binary number in sign-magnitude, sign 1's complement and sign 2's complement notation; Rules for addition and subtraction with complement representation; BCD, EBCDIC, ASCII, Extended ASCII, Gray and other codes.

LOGIC GATES AND BOOLEAN ALGEBRA : AND, OR, NOT, NAND, NOR, Ex-OR logic gates; Positive and negative logic; Fundamental concepts of boolean algebra; Demorgan's laws; Principles of duality; Simplification of Boolean expressions; Canonical and standard forms for Boolean functions; SOP and POS forms; Realization of Boolean functions using only NAND and NOR gates.

BOOLEAN FUNCTION MINIMIZATION : Objectives of the minimization procedures; Karnaugh map method; Don't care conditions; Quine-McCluskey tabulation method; Concept of prime implicants

COMBINATIONAL LOGIC CIRCUITS USING DISCRETE LOGIC GATES : Half adder and full adder; Half subtractor and full subtractor; Parity generator and checker; Code converters; Binary multiplier; Majority circuits, magnitude comparator.

COMBINATIONAL LOGIC CIRCUIT USING MSI INTEGRATED CIRCUITS : Binary parallel adder; BCD adder; Encoder, priority encoder, decoder; Multiplexer and demultiplexer circuits; Implementation of Boolean functions using decoder and multiplexer; Arithmetic and logic unit; BCD to 7-segment decoder; Common anode and common cathode 7-segment displays; Random access memory, Read only memory and erasable programmable ROMS; Programmable logic array (PLA) and programmable array logic (PAL).

INTRODUCTION TO SEQUENTIAL LOGIC CIRCUITS : Basic concepts of sequential circuits; Cross coupled SR flip-flop using NAND or NOR gates; JK flip-flop rise condition; Clocked flip-flop; D-type and Toggle flip-flops; Truth tables and excitation tables for flip-flops; Master slave configuration; Edge triggered and level triggered flip-flops; Elimination of switch bounce using flip-flops; Flip-flops with preset and clear.

SEQUENTIAL LOGIC CIRCUIT DESIGN : Basic concepts of counters and registers; Binary counters; BCD counters; Up down counter; Johnson counter, module-n counter; Design of counter using state diagrams and table; Sequence generators; Shift left and right register; Registers with parallel load; Serial-in-parallel-out(SIPO) and parallel-in-serial-out(PISO); Register using different type of flip-flop; Sequence generator.

REFERENCE :

1. MORRIS MANO : Digital Logic and Computer Design, Prentice-Hall of India, New Delhi, 1992.
2. Bartee Thomas : Digital Computer Fundamentals, McGraw- Hill, 1995.
3. Taub and Schilling : Digital Integrated Electronics, McGraw- Hill, 1985.
4. Richard Sandige : Modern Digital Design, McGraw-Hill, 1990.

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ELECTROMAGNETICS : EC 406 EC

- 1 COULOMB'S LAW AND ELECTRIC FIELD INTENSITY : Experimental law of coulomb; Electric field intensity; Field of a continuous volume charge distribution, line charge and sheet of charge; Streamlines and sketches of fields.
- 2 ELECTRIC FLUX DENSITY AND GAUSS'S LAW : Electric flux density; Gauss's law; Application of gauss's law; Some symmetrical charge distributions; Maxwell's first equation.
- 3 ENERGY AND POTENTIAL : Energy expended in moving a point charge in an electric field; Line integral; Definition of potential difference and potential; Potential field of a point charge and system of charges; Potential gradient; Dipole; Energy density in electrostatic field.
- 4 CONDUCTORS; Dielectrics and capacitance; Current and current density; Continuity of current; Conductor properties and boundary conditions; Nature of dielectric materials; Boundary conditions for perfect dielectric materials; Capacitance; Several capacitance examples.
- 5 POISSON'S AND LAPLACE'S EQUATIONS : Poisson's and laplace's equations; Uniqueness theorem; Examples of solution of laplace's equation.
- 6 STEADY MAGNETIC FIELD : Biot-savart law; Ampere's circuit law; Magnetic flux and magnetic flux density; Scalar and vector magnetic potentials.
- 7 MAGNETIC FORCES AND MATERIALS : Force on a moving charge; Force on a differential current element; Force between differential current elements; Force and torque on a closed circuit; Magnetization and permeability; Magnetic boundary conditions; Magnetic circuit.
- 8 TIME-VARYING FIELDS AND MAXWELL'S EQUATIONS : Faraday's law; Displacement current; Maxwell's equations in point form; Maxwell's equations in integral form.

REFERENCES :

1. WILLIAM H. HAYT : ENGINEERING ELECTROMAGNETICS Mc-Graw Hill, 5th Edition, 1992, 7th Reprint 1995.
2. N. N. RAO : ELEMENTS OF ENGINEERING ELECTROMAGNETICS Prentice Hall, 3rd Edition, 1992
3. JOSEPH A. EDMINISTER : THEORY AND PROBLEMS OF ELECTROMAGNETICS Mc-Graw Hill, 2nd Edition, 1993.