

SYLLABUS
FOR ADMISSION BATCH-2017
5 YEARS
INTEGRATED MASTER OF SCIENCE
IN
(ELECTRONICS &
TELECOMMUNICATION)
SESSION: 2017-2022



B.J.B AUTONOMOUS COLLEGE
BHUBANESWAR
ODISHA

SYLLABUS I.M.SC. (ELECTROMICS & TELECOMMUNICATION) COURSE STRUCTURE

SEMESTER : I

PAPER CODE	TITLE OF THE PAPER	SEM. END MARKS	MID-SEM MARKS	FULL MARKS	SEM. END EXAM DURATION
101	Mathematics - I	80	20	100	3hrs
102	Physics	80	20	100	3hrs
103	Basic Electrical Engg.	80	20	100	3hrs
104	Computer Fundamentals	80	20	100	3hrs
105	Physics Lab	50	-	50	3hrs
106	Computer Lab	50	-	50	3hrs

SEMESTER : II

PAPER CODE	TITLE OF THE PAPER	SEM. END MARKS DURATION	MID-SEM MARKS	FULL MARKS	SEM. END EXAM
201	Mathematics - II	80	20	100	3hrs
202	Communicative English	80	20	100	3hrs
203	Basic Electronics	80	20	100	3hrs
204	Digital Electronics	80	20	100	3hrs
205	Basic Electronics Lab.	50	-	50	3hrs
206	Digital Electronics Lab.	50	-	50	3hrs

SEMESTER : III

PAPER CODE	TITLE OF THE PAPER	SEM. END MARKS	MID-SEM MARKS	FULL MARKS	SEM. END EXAM DURATION
301	Mathematics - III	80	20	100	3hrs
302	Analog Communication	80	20	100	3hrs
303	Electronic Material Science	80	20	100	3hrs
304	Electrical Circuit Theory	80	20	100	3hrs
305	Analog Communication Lab.	50	-	50	3hrs
306	Electrical Circuit Lab.	50	-	50	3hrs

SEMESTER : IV

PAPER CODE	TITLE OF THE PAPER	SEM. END MARKS	MID-SEM MARKS	FULL MARKS	SEM. END EXAM DURATION
401	Mathematics - IV	80	20	100	3hrs
402	Microprocessor & Peripherals	80	20	100	3hrs
403	Digital Communication	80	20	100	3hrs
404	Electronics Devices & Circuits-I	80	20	100	3hrs
405	Microprocessor Lab.	50	-	50	3hrs
406	Communication Lab.	50	-	50	3hrs

SEMESTER : V

PAPER CODE	TITLE OF THE PAPER	SEM. END MARKS	MID-SEM MARKS	FULL MARKS	SEM. END EXAM DURATION
501	Principles of Management & Organization Behaviour	80	20	100	3hrs
502	Communication System	80	20	100	3hrs
503	Electronic Devices & Circuits-II	80	20	100	3hrs
504	Programming in C	80	20	100	3hrs
505	Communication Lab.	50	-	50	3hrs
506	'C' Prog. Lab.	50	-	50	3hrs

SEMESTER : VI

PAPER CODE	TITLE OF THE PAPER	SEM. END MARKS	MID-SEM MARKS	FULL MARKS	SEM. END EXAM DURATION
601	Computer Architecture & operating system	80	20	100	3hrs
602	Multimedia Techniques	80	20	100	3hrs
603	Measurement Systems & Transducers.	80	20	100	3hrs
604	Multimedia Lab.	50	-	50	3hrs
605	Seminar & Viva-Voce	50	-	50	3hrs
606	Project (Minor)	100	-	100	3hrs

SEMESTER : VII

PAPER CODE	TITLE OF THE PAPER	SEM. END MARKS	MID-SEM MARKS	FULL MARKS	SEM. END EXAM DURATION
701	Electromagnetic Wave & Antenna Theory	80	20	100	3hrs
702	Pulse & Digital Circuits	80	20	100	3hrs
703	Optical Fiber & Satellite Communication	80	20	100	3hrs
704	RDBMS with SQL Server	80	20	100	3hrs
705	Linear ICs & Applications	80	20	100	3hrs
706	Advanced Communication Lab.	50	-	50	3hrs
707	RDBMS Lab.	50	-	50	3hrs

SEMESTER : VIII

PAPER CODE	TITLE OF THE PAPER	SEM. END MARKS	MID-SEM MARKS	FULL MARKS	SEM. END EXAM DURATION
801	Software Engineering	80	20	100	3hrs
802	Data Communication & Networking	80	20	100	3hrs
803	Control System	80	20	100	3hrs
804	Microwave Technology & Radar	80	20	100	3hrs
805	OOP's with Java Programme	80	20	100	3hrs
806	Data Communication Lab.	50	-	50	3hrs
807	OOP's Lab.	50	-	50	3hrs

SEMESTER : IX

PAPER CODE	TITLE OF THE PAPER	SEM. END MARKS	MID-SEM MARKS	FULL MARKS	SEM. END EXAM DURATION
901	Internet & Web Technology	80	20	100	3hrs
902	Digital Signal Processing	80	20	100	3hrs
903	Advanced Microprocessor & Microcontroller	80	20	100	3hrs
904	Digital Image & Speech Processing	80	20	100	3hrs
905	VLSI Design	80	20	100	3hrs
906	DSP Matlab.	50	-	50	3hrs
907	Web Development Lab.	50	-	50	3hrs

SEMESTER : X

PAPER CODE	TITLE OF THE PAPER	SEM. END MARKS	MID-SEM MARKS	FULL MARKS	SEM. END EXAM DURATION
X-1	Broadband Communication	80	20	100	3hrs
X-2	Wireless Mobile Communication	80	20	100	3hrs
X-3	Embedded System	80	20	100	3hrs
X-4	Soft Computing	80	20	100	3hrs
X-5	Priject (Major)	80	-	100	3hrs
X-6	Seminar	50	-	50	3hrs
X-7	Comp. Viva-Voce	50	-	50	3hrs

SEMESTER-I MATHEMATICS-I PAPER-101

MARKS-80**UNIT-I****Ordinary Differential Equations:**

Differential equations of first order, Physical applications, Linear differential equations, Homogeneous second order linear equations with constant coefficients, spring mass systems, Non-homogeneous second order linear equations, variation of parameters, Normal form, Change of dependent and independent variables.

UNIT-II Matrices: Notation and Terminology, The solution of simultaneous equations by Gaussian elimination, Rank and row-echelon normal form. Arithmetic of Matrices, Inverses, Determinant, Linear Dependence. Homogeneous and Non homogeneous systems. Norms and Inner products, Orthogonal sets, Least squares, Eigen values and Eigen vectors. Systems of Linear Differential equations. Symmetric and simple matrices.

UNIT-III Vector Analysis : Vector Algebra, Vector Differentiation, Gradient, Cylindrical and Spherical coordinator, Integral theorems.

UNIT-IV

Statistics: mean, variance, moment generating function and characteristic function, law of large numbers ancetral limit theorem, sampling distribution, point and interval estimation, testing of hypothesis, goodness of fit and contingency table.

UNIT-V

Probability: Axiomatic definition of probability, laws of probability, conditional probability, random variables, Bayes rule, discrete and continuous random variable, probability mass function, probability density function, mathematical expectation.

TEXT BOOKS:

1. Mathematical Methods by M.C. Potter and J.Goldberg (Prentice Hall) - Chapters: 1, 2, 3 (relevant portions).
2. Engg. Mathematics by B. S. Grewal
3. Engg. Mathematics by H.K. Das

PHYSICS PAPER-102

MARKS-80**UNIT-I**

Oscillations and Waves: Oscillatory systems : Simple harmonic oscillations, Damped harmonic oscillations, forced vibration resonance, coupled oscillation, waves as periodic variation quantity in space and time, wave equation, longitudinal and transverse waves, progressive and stationary waves. Super position of waves: Two –beam super position, multiple beam superposition, coherent and in coherent super position.

UNIT-II

Interference: Two source interference patterns (Young's double slit), Intensity distribution, And Transverse section- straight fringe, longitudinal sections- circular fringe. Interference in thin films: Fringes of equal inclination and fringes of equal thickness color of thin films. Newton's Rings, determination of wave length of light, refractive index of liquid. Michelson interferometer: Construction, working and use.

UNIT-III

Polarization: Polarization of transverse waves, Plane, circular and elliptically polarized light, polarization by reflection, refraction and scattering

Double refraction: Nicol Prizme, quarter wave plate, half wave plate- construction and use. Production and analysis of circular and elliptically polarized light.

UNIT-IV

Quantum Physics: The need for quantum physics: Historical overview, Black body radiation, photoelectric effect, Compton scattering, pair production.

Matter waves: De – Broglie Hypothesis, experimental evidence, Bohr model of hydrogen atom, spectral lines.

Features of quantum mechanics: Transition from deterministic and probabilistic, wave functions probability density, superposition principles, expectations values, stationary states, time evolution of states.

UNIT-V

Diffraction : Huygens's Principle, Fresnel and Fraunhofer diffraction, zone plate. Fraunhofer diffraction due to a single slit.

Plane transmission grating: Diffraction spectra, determination of wave length of light, dispersion. Resolving power of single slit, telescope, microscope, grating.

TEXT BOOKS:

- 1) Physics- I by prof. B.B. Swain
- 1) Optics - A.K. Ghatak
- 2) Geometrical & Physical Optics – P.K. Chakraborty
- 3) Concepts of Modern Physics – A . Besier
- 4) E.Merzbacher, Quantum Mechanics, 3rd Edition, John Wiley NY
- 5) A. Bohm, Quantum Mechanics : Foundations & Applications 2nd Edition, Springer varlag.

BASIC ELECTRICAL ENGINEERING PAPER-103

MARKS-80

UNIT-I

D.C. circuits:- Ideas of electric circuits, power and energy in circuits, series and parallel circuits, kirchoff's law and their applications, branch and loop current method of solving networks, use of crammers rule.

Capacitance :- Capacitor, types of capacitor, Capacitors in series & parallel, charging & discharging of capacitor.

UNIT-II

A.C. circuit fundamentals:- Alternating quantities, sinusoidal rectangular and triangular wave forms, effective average value and form factor, power and power factor addition and subtraction of AC quantities of same frequencies, phasor and complex representation of sinusoidal quantities, simple parallel and series circuits, series and parallel resonance.

UNIT-III

Analysis of Three Phase circuits:- Elementary Concepts of Three phase Circuits relationship between line & phase voltage & currents in a star & Delta connection , measurement of power & power factor of a balanced three phase load.

UNIT-IV

Transformer :- Introduction, Working Principle, construction, Ideal Transformer, E.M.F equation of a Transformer, Voltage transformation Ratio , losses in a Transformer & Efficiency of a Transformer.

D.C Motors & Gnerators :- Construction, working Principle, basic theory & Uses.

UNIT-V**Measuring Instruments :**

Construction , Principles of Operation & basic theory of measurement of following Instruments : DC bridges(Wheatstone) , PMMC, Moving Iron, Voltmeter, Ameter, Ohmmeter, Galvanometer, DC Potentiometer, electrical resonates frequency meter.

TEXT BOOKS:

1. Basic Electrical engineering by C.L. Wadhwa .(New age Publisher)
2. Basic Electrical engineering by B.L. Thareja
3. Basic Electrical by prof. B.B. Swain

COMPUTER FUNDAMENTAL PAPER-104

MARKS-80**UNIT-I**

Introduction to Computer: - Characteristics of computer, Evolution & Generations of computer, basic computer organization, Processor. Main Memory: (RAM, ROM, PROM, EPROM, EEPROM, Cache).

UNIT-II

Secondary Storage Devices: Magnetic tape, Magnetic disk, Optical disk, Mass Storage Devices, Storage Hierarchy

Input Devices : Keyboard, Mouse, Scanner, Track ball, Joystick, Light Pen.

Output Devices: Monitors, Printers, Plotters, Screen Image Project.

UNIT-III

Computer Software : Introduction, Relation between hardware & software, types of software., Local System Architecture Acquiring software, Steps for software development, Purpose, Algorithm, Flow chart, Pseudocode.

UNIT-IV

Computer Language : Machine Language, Assembly Language, High level language, OOP Language, Interpreter & Compiler. General configuration of typical Computer.

UNIT-V

Fundamentals of Computer network : Topologies, Protocol , LAN, MAN & WAN.

The Internet : Definition, History, basic Services, WWW, Browsers, Uses.

Multimedia : Multimedia Computer System, Components, Applications.

Classification of Computers : Notebook Computers, PCs, Work Stations, Main Frame Systems, Super computers, Clients & Servers.

TEXT BOOKS:

1. Computer Fundamentals by : P. K. Sinha.
2. Fundamentals of Computer by : Leon & Leon.

PHYSICS-LAB PAPER-105

MARKS-50

1. Determination of Young's Modulus by Searie's Method.
 2. Determination of Rigidity Modulus by Static Method.
 3. Determination of Surface Tension by Capillary Rise Method.
 4. Determination of Acceleration due to Gravity by Bar/ Kater's Pendulum.
 5. Determination of Thermal Conductivity by Lees Method.
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6. Determination of Wavelength of light by Newton's Rim Apparatus.
7. Determination of Grating Element of a Diffraction Grating.
8. Plotting of characteristics curve of a P – N Junction Diode.
9. Plotting of Characteristics curve of BJT.
10. Verification of laws of vibration of string using Sonometer.
11. Determination of wave length of Laser source by diffraction rating method.
12. Study of Hall effect.
13. Study of Photoemission.

COMPUTER-LAB PAPER-106

MARKS-50

Introduction to Windows operating System
Ms-Word
Ms-Excel
Ms-Power point
Ms-Access
Introduction to LINUX Operating System with commands
Internet Uses.

SEMESTER-II MATHEMATICS-II PAPER-201

MARKS-80

UNIT-I

Fourier series:

Fourier Theorems, Computation of Fourier coefficients, Forced Oscillations and miscellaneous Expansion Techniques.

UNIT-II

Laplace Transforms:

The Laplace Transform (L.T.) L.T. of Derivatives and Integrals, Derivatives and Integrals of L.T's, L.T. of Periodic functions, Inverse Laplace Transforms , Convolution Theorem, Solutions of differential equation, Special Techniques.

UNIT-III

Complex Variables:

Review of complex numbers, formulae of Euler & De Moivre, analytic functions, Cauchy-Reimann conditions, elementary complex functions and analyticity, Cauchy's Theorem and Integral formula,

UNIT-IV

Taylor's series, complex power series- representation of an analytical function in terms of a power series, Laurent series, residue theorem, contour integration.

UNIT-V

Special function:

Properties of power series solutions for ordinary differential equation, the method of Frobenius , Gamma function, Laguerre polynomials , Root differing by an integer, Bessels equation, Non – homogeneous equation

TEXT BOOKS:

1. Mathematical Methods by M.C. Potter and J. Goldberg
2. Advanced Engineering Mathematics - by E. Kreysjig.

COMMUNICATIVE ENGLISH PAPER-202

MARKS-80**UNIT-I**

Communication in language - its features. Writing skills - its features - how it differs from other language skills. How to put ideas together, writing paragraphs, identifying the logical development of ideas in piece writing.

UNIT-II

Report writing - How to present facts clearly and logically. Standard formats for writing Preparation of abstract Technical documents.

UNIT-III

Reading skills – Reading to get main ideas. Identifying the logical development of ideas in a piece writing, Reading to summarize, Reading to take and make notes.

UNIT-IV

Speaking –Group discussion based on current topics. Group dynamics Paralinguistic communication - gestures, actions, body language Linguistic tools for better communication.

UNIT-V

Audio-visual aids for communication.

Communicative/functional Grammar –Communicative use of structures, collocations

TEXT BOOKS:

1. A Communicative Grammar of English By Geoffrey Leech and Jan Svartvik, Longman
2. A millennium Guide to Writing and Speaking English By J.D. Chand & B.C. Das
3. Oxford Guide to Writing and Speaking , OUP. By John Sealy

BASIC ELECTRONICS PAPER-203

MARKS-80**UNIT-I**

Properties of Semiconductors: Introduction, Types of semiconductor, intrinsic semiconductors, Extrinsic semiconductor, Position of Fermi level, Current flow in semiconductor, charge densities in p and n materials; conduction by charge drift; Conduction by diffusion of charge.

Junction Diode:

The p-n junctions, The unbiased & biased p-n junction, current-voltage characteristics of a p-n junction, rectifier operation, Filters, Half wave & Full wave rectifier with filters, voltage multiplier, Clipping circuits & Clamping circuits, Zener diode.

UNIT-II**Bipolar junction transistor:**

The junction Transistor, Transistor Amplifier, Configuration of Transistor: CB, CE & CC, Static characteristics of Transistor. Transistor Biasing, Operating point & load line analysis of transistor amplifier.

Field Effect Transistors: Introduction to FET, Junction field Effect Transistor(JFET), Metal Oxide Semiconductor FET(MOSFET), Types of MOSFET, circuit characteristics of FET; biasing of FET, FET parameters, Comparison between FET & BJT.

UNIT-III

Amplifiers: Basic Concepts of Amplifier, Classification of Amplifiers, Cascading of Amplifiers, RC-coupled CE-amplifier; frequency response of RC amplifier; gain-bandwidth product; Transformer-coupled Amplifier. Power Amplifiers: class A power amplifier; push-pull principle; Class B push-pull amplifier. Tuned amplifier, Amplifier Characteristics.

UNIT-IV

Feedback ckt & Oscillators: Introduction to feedback ckt, Principles of negative feedback in amplifiers, gain of negative feedback amplifier, advantages of negative feedback. Introduction to Oscillators, types of Oscillators, Feedback Oscillator concepts, Oscillatory ckts, essentials of transistor oscillators, Different types of transistor oscillators: Colpitts, Hartley, Phase shift, Wein – Bridge & Crystal Oscillator.

UNIT-V

Communication systems: Introduction to communication systems, Radio Communication, Radio Transmitter, Radio Receiver, Satellite Communication, Cellular Telephone Network, Analog Communication, Digital Communication, comparison between Analog and Digital communication.

TEXT BOOKS:

1. Electronics Fundamental & Applications by D .Chattopadhyay and R.c. Rakhsit
2. A Text book of Applied Electronics by R.S. Sedha (S. Chand)
3. Basic Electronics by Boylestead.
4. Basic electronics by V.K. Meht

DIGITAL ELECTRONICS

PAPER-204

MARKS-80

UNIT-I**Number system and codes:-**

Introduction, Decimal to Binary conversion and Binary to Decimal, Decimal to octal and Octal to Decimal, Decimal to hexadecimal and Hexadecimal to Decimal, Octal to binary and vice versa, Binary arithmetic addition, Subtraction (1's compliments 2's compliments), Multiplication and Division codes: Weighted code, non weight code (Excess -3 code, Gray code)

UNIT-II

Boolean algebra and Logic gates:- Introduction, Boolean logic operations, Basic laws of Boolean algebra, Demorgan's theorem sum of product and product of sum, Karnaugh map (upto 4 variables) Logic gates: OR, AND, NOT, NAND, NOR, EX-OR, EX-NOR gate, Implementation of Logic circuits.

UNIT-III

Combinational circuits: - Introduction, Half adder, Full adder, Half and Full subtractor, Parallel binary adder, serial adder, Multiplexer(4 to 1, 8 to 1), Demultiplexer (1 to 4 and 1 to 8) Decoder(BCD to Decimal and BCD to Seven segment Decoder) Decimal to BCD encoder.

UNIT-IV

Sequential logic circuit:- Introduction, Flip-flops, S-R and clocked S-R Flip-flop, D flip-flop, T flip-flop, J-K Flip-Flop, Master Slave Flip-Flop.

UNIT-V

Counters: Introduction: - asynchronous ripple counter, synchronous parallel counter, 4-bit shift register. Logic Family: TTL, RTL, DTL, ECL, CMOS.

TEXT BOOKS:

1. Digital Fundamentals by Floyd
2. Digital Electronics by M.Mano
3. Digital Electronics by R.P. Jain.

BASIC ELECTRONICS-LAB PAPER-205

MARKS-50

1. Study of passive Components (Resistors, Inductors, Capacitors)
2. Study of passive Components (Diode, Transistor, Zener diode)
3. Study the characteristics of PN junction diode.
4. Study of Half wave & Full wave Rectifiers.
5. Study the characteristics of Zener diode.
6. Study the different characteristics of Multimeter (Voltage, current & resistance).
7. Study of input & output characteristics of CB, & CE transistor applications.
8. Study of CRO & Function Generator
9. Study the frequency response of RC coupled Amplifier through CRO.
10. Study the frequency response of Tuned Amplifier through CRO.

DIGITAL ELECTRONICS-LAB PAPER-206

MARKS-50

1. Study & Verify the Logic gates with their truth tables.(7400, 7408, 7432)
2. Study & Verify the Half-Adder circuit with truth table.
3. Study & Verify the Full-Adder circuit with truth table.
4. Study & Verify the Half-Sub tractor circuit with truth table
5. Study & Verify the Full-Sub tractor circuit with truth table
6. Study & Verify the Multiplexer circuit with truth table (74LS373)
7. Study & Verify the De-Multiplexer circuit with truth table
8. Study the various Decoders.(BCD to Decimal & BCD to Seven segment)
9. Study & Verify the Encoder circuit with truth table
10. Study the Various types of Flip-Flops with truth tables.- (7475, 7474)
11. Study of various Synchronous Counters
12. Study of various Asynchronous Counters

SEMESTER – III MATHEMATICS –III PAPER-301

MARKS-80**UNIT-I**

Complete general and particular solutions, Second order linear PDE, Interior and exterior, boundary value problems : Classification of second order linear partial differential equations - Solutions of one - dimensional wave equation, one-dimensional heat equation Steady state solution of two-dimensional heat equation.

UNIT-II**Probability and random variables:**

Probability concepts, Random variables, Moments, Moment Generating function, Binomial, Poisson, Geometric, Negative binomial, Exponential, Gamma, Weibull distributions, Functions of random variable, Chebychev inequality.

UNIT-III

Two-dimensional random variables: Marginal and conditional distributions, Covariance, Correlation and regression, Transformation of random variables, Central limit theorem.

UNIT-IV

Random processes: Classification, Stationary and Markov processes, Binomial process, Poisson process, Sine-wave process, Ergodic process, Random sampling, estimation of parameters, Confidence intervals, Testing of hypothesis, acceptance sampling.

UNIT-V

Linear Programming Problems: Definition, Examples and Formulation , Graphical Solution , Solution by Simplex Method , Duality Theory , Dual Simplex Method ,Solution Of Engg. Problems of Planning and Scheduling

TEXT BOOKS:

1. Kapur J.N and Saxena H.C., “Mathematical Statistics” S.Chand & Company Ltd,New Delhi,(1997.)
2. O Flynn M., “ Probabilty,RandomVariables & random processes “,Harper & Row Publishers,New York,1982
3. S Kalavathi,Operation Reasearch,Vikash Publication
4. H.A Taha Prentice Hall Of India

REFERENCE BOOKS:

1. E.Kreyszig,Advanced Engineering Mathematics, *th Edition,Wiley Eastern
2. B.S Grewal,Higher Engineering Mathematics,Khanna Publishers
3. Jain & IyengarAdvanced Engineering Mathematics,Narosa Pub.House

ANALOG COMMUNICATION PAPER-302

MARKS-80

UNIT-I**Spectral Analysis:-**

Fourier Series ; The Sampling Function. The Response of a linear System. Normalized Power in a Fourier expansion. Impulse Response . Power Spectral Density. Effect of Transfer Function on Power Spectral Density. The Fourier Transform. Physical Appreciation of the Fourier Transform. Transform of some useful functions. Scaling, Time- shifting and Frequency shifting properties. Convolution, Parseval’s Theorem. Correlation between waveforms; Auto-and cross correlation. Expansion in Orthogonal Functions. Correspondence between Signals and Vectors. Distinguish ability of Signals.

UNIT-II

Amplitude - Modulation Systems: - A Method of Frequency translation.Recovery of baseband Signal. Amplitude Modulation, Spectrum of AM Signal. The Balanced Modulator. The Square law Demodulator. DSB–SC, SSB-SC and VSB-SC - Their Methods of Generation and Demodulation. Frequency Division Multiplexing (FDM).

UNIT-III

Frequency Modulation Systems: - Concept of Instantaneous Frequency. Generalized concept of Angle Modulation.Frequency modulation, Frequency Deviation, Spectrum of FM Signal with Sinusoidal Modulation. Bandwith of FM Signal Narrowband and wideband FM. Bandwith required for a Gaussian Modulated WBFM Signal. Generation of FM Signal. FM Demodulator. PLL), Preemphasis and De-emphasis.

UNIT-IV

Mathematical Representation of Noise: - Sources and Types of Noise. Frequency Domain Representation of Noise. Power Spectral Density. Spectral Components of Noise. Response of a Narrow band filter to noise. Effect of a Filter on the Power spectral density of noise. Superposition of Noises, Mixing involving noise. Linear Filtering. Noise Bandwidth.

UNIT-V

Noise in AM Systems :- The AM Receiver, Super heterodyne Principle, Calculation of Signal Power and Noise Power in SSB-SC, DSB-SC and DSB+C. Figure of Merit,

Noise in FM System: - Mathematical Representation of the operation of the Limiter Discriminator; Calculation of output SNR. Comparison of FM and AM.

TEXT BOOKS:

1. Modern Digital and Analogue Communication Systems by B.P. Lathi, 3rd Edition, Oxford University Press. Selected Portion from Ch. 2,3,4,5 and 12.
2. Communication Systems by Siman Haykin, 4th Edition, John Wiley & Sons, Inc.

REFERENCE BOOKS:

1. Digital and Analog Communication Systems by Leon W. Couch, II, 6th Edition, Pearson Education Pvt. Ltd.
2. Communication system – Singh & Sapre
3. Analog & Digital Communication – Sanjaya Sharma

ELECTRONIC MATERIAL SCIENCE PAPER-303

MARKS-80

UNIT-I

Crystal Physics:-Crystalline and non-crystalline materials, Bravais lattices, Crystal systems, Symmetry elements, Simple crystal structures, Packing factor for sc, bcc, fcc, hcp structures, Miller Indices, Imperfections in Crystals, Bragg's law and x-ray diffraction methods to study crystal structure.

UNIT-II

Electric & Electronic Materials: - Classical free Electron theory of metals, Electrical conductivity of Al, Draw backs of classical theory, Quantum free electron theory of metals and its importance, Density of states, Fermi, Dirac statistics, Electrical Conduction, Classification of semiconductor materials, Materials and Technology for integrated circuits, Photonic materials, super conductivity and special super-conducting materials, Ferrites. Quartz crystal, Dielectric materials. Piezoelectric and Ferro-electric materials, electromechanical materials, Mechanism of polarization, Its measurements

UNIT-III

Magnetic Materials :- Different types of magnetic materials and their properties, Domain theory of ferromagnetism, Heisenberg criteria, Hysteresis, Energy product of a magnetic material, Ferrites and their applications, Magnetic recording materials, Metallic glasses.

UNIT-IV

Dielectric material :- Active and passive dielectrics and their applications, Various polarization mechanisms in dielectrics and their frequency and temperature dependence, Internal field and deduction of Clausius Mosotti equation, Dielectric loss, Dielectric breakdown.

UNIT-V

Optical materials: - Optical properties of metals, insulators and semiconductors, Phosphorescence and fluorescence, Excitons, traps and colour centers and their importance. Different phosphors used in CRO screens, Liquid crystal as display, LED materials, Working of LED, Plasma Displays, Thermography and its applications, Photoconductivity and photo conducting materials.

TEXT BOOKS:

1. Arguman M . ‘ Material Science’, Anuradah Technical Book Publis.
2. Callister J, ”Material Science for Engineer”
3. Materials Science and Engineering, Raghavan, PHI, New Delhi, 1993
4. PILLAI S.O,Solid state physics, New Age inc.1998
5. Van Vlack L.H., Material Science and Engineering, prentice Hall of India, New Delhi, 1993

ELECTRICAL CIRCUIT THEORY

PAPER-304

MARKS-80

UNIT-I

Circuit elements and Energy Sources:-Circuit Elements ,Series & Parallel combination of resistances , Inductances & Capacitances, Energy Sources , Source Transformation , A.C. In inductance & Capacitance, Star-Delta Connection,

Nodal & Mesh analysis: - Kirchoff’s Current & Voltage laws, Nodal & Mesh analysis of electric circuits.

Sinusoidal Steady State Analysis of RLC Circuits: - Series RL, Rc , & RLC circuits, Series & Parallel A.C circuits, Current & Voltage division in A.c Circuits.

UNIT-II

Resonance & Selectivity:- Introduction, Series Resonance, Parallel resonance , Resonance between parallel R-C & R-L circuit, Parallel resonance of RLC circuits.

Filter :- Introduction to filter, types of filter, filter circuits, low pass filter, high pass filter, band pass filter, band reject filter.

.UNIT-III

Network Theorems: - Introduction, Superposition theorem, Thevenins theorem, Norton’s theorem, Maximum power transfer theorem, Millman’s theorems & Reciprocity theorem, Solved problems.

UNIT-IV

Transient response of Passive circuits: - Introduction, Transient response of series R-L, R-C & RLC circuits having D.C excitation. Transient response in series R-L , RC and RLC circuit with sinusoidal excitation .

UNIT-V

Two port network: - Introduction, network elements, Classification of networks, network configuration, Z-parameters ,Y-parameters, Hybrid parameters,

Network topology: - Concept of Network Graph, Relation between Twigs & links, Properties of a tree in a graph, No. of trees in a graph, Tie-set matrixs, Cut set matrix, Principles of Duality.

TEXT BOOKS:

1. Circuit Theory (Analysis & Synthesis) by A. Chakraborty.
2. Network Analysis by B.R Gupta

ANALOG COMMUNICATION LAB

PAPER-305

MARKS-50

1. Amplitude Modulation

- I) Generation of DSB-SC with sinusoidal modulating wave, Recording of Modulated waveform with various values of m. Measurement of power in sidebands.
- ii) Generation of DSB-SC.

- iii) Generation of SSB. Generation of VSB signal.
- 2. Frequency Modulation**
- I) Generation of Narrow FM using Balanced Modulator.
- ii) Direct method of generating wideband FM signal.
- iii) Study of Pre emphasis & De-emphasis in FM.
- 3. Detector circuits**
- I) Envelope Detector
- 2) Product Detector

ELECTRICAL CIRCUIT LAB PAPER-306

MARKS-50

1. Study & Verify the Kirchoff 's Laws
2. Study & Verify the Network Theorems.
3. Study the Resonance Circuits
4. Design and Study Of Low Pass, high Pass, Band Pass, Band reject Filter.(both active and passive)
5. Study Of Couple Circuits
- 6 . Study Of Bridge Circuits
7. Power Measurements in 3-phase circuits.
8. OC and SC tests on Transformers.

SEMESTER-IV MATHEMATICS-IV PAPER-401

MARKS-80

UNIT-I

Algebraic Equations of Linear Systems: - Representation of linear systems and mathematical modeling, Gauss elimination method, Cheking zero pivoted elements, solution of ill conditioned systems, Jacobi and Gauss-Seidal methods

UNIT-II

Interpolation :- Newton's forward and backward interpolation, Lagrange's interpolation
Differentiation and Integration based on polynomials, Trapizoidal rule, Simpson's 1/3 rule and Gaussian rule of integration

UNIT-III

Numerical Methods :- Idea on algorithm development, Introduction to errors in numerical methods
solution of non-linear (polynomial) equations Iterative, Newton-Raphson, RegulaFalsi methods

UNIT-IV

Parameter estimation :- Least Square method of linear parameters, Ordinary Differential equation, Euler's method, Use of Taylor's method, 1st and 2nd order Runge-Kutta method, Simple predictor and corrector method.

UNIT-V

Sensitivity Analysis , Transportation Problems , Assignment Problem, Network Models , Minimal Spanning Tree Problem , Maximal Flow Problem ,Shortest Route Problem ,Minimal Cost Flow Problem , Algorithms and Application to be covered.

TEXT BOOKS:

1. Numerical Methods by S. S. Sasthri
 1. Computer Oriented Numerical methods by V. Rajaraman
-

2. Computer simulation of Electronic circuit by R.Raghuram
3. S Kalavathi, Operation Research, Vikash Publication
4. H.A Taha Prentice Hall Of India

MICROPROCESSOR & PERIPHERALS PAPER-402

MARKS-80

UNIT-I

Microprocessor Architecture:- Introduction to Microprocessor and Microcomputer, Architecture of 8085, Pins & Signals, Register Organization, Timing & Control Module, 8085 Instruction Timing & Execution. Interrupts, addressing modes

UNIT-II

Architecture of a 16-bit Microprocessor: Internal organization of 8086, Signal descriptions, Physical memory organization, BIU, EU, Minimum mode 8086 system and timings, Maximum mode 8086 system and timing, addressing modes.

UNIT-III

Language Programming :- Instruction set of 8085, Memory & I/O Addressing, Assembly language programming using 8085 Instruction Set, use of Stack & Subroutines. Addressing modes, Instruction set, Assembler directives and Operators, Data movement instructions, Arithmetic and logic instructions, Program control instructions, Recursive procedures.

UNIT-IV

Basic Peripherals and Their Interfacing :- Memory and I/O interfacing, Programmable Peripheral Interface (8255), Interfacing A/D and D/A converters.
Special Purpose Programmable Peripheral Devices and Their Interfacing: Programmable Interval Timer (8253), Programmable Interrupt Controller (8259), Programmable Communication Interface (8251), DMA Controller (8237/8257).

UNIT-V

Microprocessor Applications: Interfacing scanned multiplexed displays and 7 Segment LED Display, Interfacing matrix keyboard, Stepper motor interfacing, Microprocessor Based Traffic Control, Generation Of Square Waves

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – Ray and Bhurchandi
2. Fundamentals of Microprocessors and Microcomputers – B. Ram.
3. Microprocessor and its applications by R. Gaonkor

DIGITAL COMMUNICATION PAPER-403

MARKS-80

UNIT-I

Sampling Theorem, Signal Reconstruction, Practical Difficulties. The Treachery of Aliasing, The Antialiasing Filter; Discrete Fourier Transform, Application of Sampling Theorem: PAM, PWM and PPM Signals.

Pulse Code Modulation:- Quantization of Signals, Quantization error. Non-uniform Quantization. Compander. encoder,

UNIT-II

Digital Modulation Techniques :- Generation, Transmission, Reception, Spectrum and Geometrical Representation in the Signal Space of BPSK, DPSK, Differentially-Encoded PSK, QPSK, $\pi/4$

QPSK, M-ary PSK, BFSK, M-ary FSK, and Minimum Shifting Keying (MSK).

UNIT-III

Noise in PCM and DM : - Transmission Bandwidth and output SNR. A TI Carrier System: Synchronizing and Signaling. Differential PCM. Delta Modulation. Adaptive Delta Modulation, Output SNR. Comparisons with PCM.

Calculation of Quantization Noise Power, Output Signal Power, and the Thermal Noise Power. Output SNR of PCM using different modulation techniques. Output SNR of DM.

UNIT-IV

The Concept of amount of Information, Average Information, Entropy; Shanon-Fano Algorithm. Shanon's Theorem – Channel Capacity, Bandwidth - S/ N Trade off. Use of Orthogonal Signals to attain Shannon's limit. Efficiency of orthogonal Signal transmission.

Coding: - Parity Checkbit Coding for error Detection, Hamming distance. Block codes - Coding and Decoding Algebraic Codes: Hadamard Code, Hamming Code.

UNIT-V

Principles of Digital Data Transmission :- A Digital Communication System. Line Coding-Variou line Codes. Polar Signaling ON-OFF. Signaling, Bipolar Signaling. Pulse Shaping: Nyquist Criterion for zero ISI. Scrambling. Regenerative Repeater – Preamplifier, Equalizer. Eye diagram. Timing Extraction, Timing Jitter.

TEXT BOOKS:

1. Communication Systems by Siman Haykin, 4th Edition, John Wiley & Sons, Inc.
2. Digital and Analogue Communication System, Leon W. Couch-II, 6th Edition, Pearson

REFERENCE BOOKS:

1. Modern Digital and Analogue Communication Systems by B.P. Lathi, 3rd Edition, Oxford University Press. Selected Portion from Ch. 2,3,4,5 and 12.
2. Digital Communication System, By Sanjay Sharma,

ELECTRONIC DEVICES & CIRCUITS-I PAPER-404

MARKS-80

UNIT-I

Semiconductor Diode:- Introduction, V-I characteristics of P-N junction Diode, Forward and Reverse characteristic, Diode current equation, effect of temperature, The ideal Diode, static & Dynamic resistance of a diode.

Diode Applications:- Introduction, clipping circuits, positive, negative, biased clampers, Practical Clamper circuit & Applications, Voltage Multipliers: Voltage doublers & voltage Tripler & quadruple.

UNIT-II

Special purpose diodes and optoelectronics Devices:- Introduction, zener Diode: reverse characteristics, equivalent circuit & applications, Tunnel Diode:- V-I characteristics, equivalent circuit & application. Varactor Diode:- Specification and application, schottky Diode:- Introduction & application, PIN Diode:- Working principle & application.

Liquid crystal display:- Advantages and applications, photo diode & its application, Laser diode & its application.

UNIT-III

Field Effect Transistors:- Introduction, Types of FET, Junction FET, Formation of depletion region, operation & characteristics of IFET, Drain characteristics, Effect of Gate-to-Source voltage, Transfer char, FET parameters, mathematical expression for transconductance, comparison between FET & BJT, MOSFET, Types of MOSFET, Deplition Type, working Principal, Drain characteristics &

Transfer characteristics of depletion – type MOSFET, circuit symbol, enhance type MOSFET:- Working Principal, Drain characteristics & Transfer characteristics of Enhance – type MOSFET, Circuit Symbol, Advantages of N-channel MOSFETs over P-Channel, complementary MOSFETs(CMOS).

UNIT-IV

Thyristors:- Introduction , types of Thyristors , Silicon controlled Rectifier(SCR), SCR biasing, Operation and equivalent circuit, Tuning on/off SCR, V-I characteristics of SCR , Applications of SCR, Triac, operation, V-I characteristics & applications of Triac, Difference between SCR & Triac, Unijunction, Transistor (UJT), Basic construction, Equivalent ckt, operation V-I characteristics of Diac, silicon controlled surtch(SCS), operation and application of SCS.

UNIT-V

Hybrid Parameters:- Introduction, h-parametere of a linear circuit, Determination & meaning of h-parameter, h-parameter of a Transistor, Hybrid equivalent circuit for common Enitter , common Base & common collector Transistor .

Regulated D.C. power supply:- Introduction, ordinary (unregulated) power supply, disadvantages of ordinary power supply, Regulated power supply, Voltage regulators, Low Voltage, Zener diode & Zener follower Regulator, Transistor follower & Negative feedback regulator, High voltage Regulator.

TEXT BOOKS:

1. Electronic circuits by R.S. Sedha (S. Chand)
2. Electronic Devices& Circuits by M.L. Anand
3. Electronic Devices Boylestead.

MICROPROCESSOR LAB PAPER-405

MARKS-50

A) 8085

1. Addition, Subtraction, Multiplication, Division of two 8 bit numbers resulting 8/16 bit numbers.
2. Smallest /Largest number among n number in a given data array + Binary to Gray Code / Hexadecimal to decimal conversion.

B) INTERFACING

3. Generate square waves on all lines of 8255 with different frequencies (concept of delay program)
4. Study of Traffic Light controller
5. Study of Elevator Simulator
6. Study of 8253 and its operation (Mode 0, Mode 2, Mode 3)
7. Study of Mode 0, Mode 1, BSR Mode operation of 8255.
8. Study of 8279 (keyboard & Display interface)
9. Study of 8259 Programmable Interrupt controller

COMMUNICATION LAB PAPER-406

MARKS-50

1. AD and DA converters - Linearity .
 2. 2 Level to N- level converter .
 3. Delta Modulator and Adaptive Delta Modulator .
 4. Generation of PSK , DPSK and QPSK Signal.
 5. Generation of FSK and MSK Signal.
 6. Generation of ASK and Q-AM Signals .
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8. Design of a PN sequence Generator.
9. TDM (MAT LAB Simulation)
10. Performance of any digital mod/demod Scheme in the presence if noise (MAT LAB Simulation).

SEMESTER-V
PRINCIPLES OF MANAGEMENT
& ORGANIZATIONAL BEHAVIOR
PAPER-501

MARKS-80

UNIT – I

Introduction: Management Concept; Managerial Roles; Functions of managers; Levels of management; Managerial skills; Management process; Characteristics and Importance of management.

UNIT – II

Planning: Nature; Significance; Process and Types; Management By Objectives; Advantages and Disadvantages. **Decision Making:** nature and Process; Group decision making-Techniques..

UNIT – III

Organizing: Nature; Significance; Principles of organizing; Centralization and Decentralization; Organization structure. **Staffing:** Importance and Process of staffing.

Controlling: Concept and Process; Techniques of control.

UNIT –IV

Introduction: Meaning & Definition; Importance of OB; Various schools of thought.

Perception: Meaning; Factors affecting; Application of perception concepts to OB;

Attitudes: Concept; Types; Attitudes & Consistency.

UNIT – V

Motivation: Concept; Need hierarchy theory, Cognitive theory ; Behavioral theory. **Personality:** Determinants, Theories – Psychoanalytical.

Learning: Concept & Theories. **Leadership:** Meaning; Theories- Behavioral theory, Contingency theories, Transformational theory.

TEXT BOOKS:

1. Principles of Management: R. K. Sharma & S. K. Gupta (Kalyani)
2. Organisational Behaviour: Rao & Narayan
3. Organisational Behaviour: K Aswathappa (HPH)

REFERENCES BOOKS:

1. Principles of Management: L. M. Prasad (S.Chand & Co.)
2. Organisational Behaviour: Stephen Robbins (PHI).
3. Organisational Behaviour: L.M. Prasad
4. Management By Harlod Kaontz(TMh)

COMMUNICATION SYSTEM
PAPER-502

MARKS-80

UNIT – I

Radio Transmission system :-Introduction, AM Transmitter, Broadcast transmitter(Block Diagram & Function of each block i,e Master Oscillator, Buffer amplifier, Harmonic Generators), Block

diagram and function of Single sideband Transmitter, Block diagram of Frequency modulated Transmitter and function of each blocks, FM Stereo Transmitter, Pre-emphasis circuits.

UNIT – II

Radio Reception System :-AM Broadcast receivers: RF amplifier, Image signal frequency, IF amplifier, Detector, Automatic volume control, SSB receivers, Frequency modulated receivers, Stereo FM Receiver, measurement of receivers performance: Selectivity, Sensitivity, Fidelity.

UNIT – III

Television Transmission System: - Introduction, Television Scanning Process, Interlaced Scanning, Composite video Signal, CCIR-B Standard, TV Camera Systems: Image Orthicon, Vidicon, CCD Camera

UNIT-IV

Block diagram of TV transmitter, Block diagram of monochrome TV receiver, Principles of color television, Comparison of NTSC, PAL & SECAM systems, Transmission & reception of PAL system, High definition TV, LCD TV.

UNIT – V

Telephone instruments and Signals:- Introduction, Subscriber loop, standard telephone set, Basic call procedures, call progress tones and signals, cordless telephone, caller ID, electronic Telephone, Cross talk & its types. Public Telephone Network, Instruments, Local Loops, Trunk Circuits & Exchanges.

TEXT BOOKS:

1. Principles of communication Engg. By Singh and Chhabra
2. Advanced Communication System by Wayen Tomasi
3. Electronic Communication systems by Kennedy & Davis.
4. Manichromo & color TV. By R. R. Gulati

ELECTRONIC DEVICES & CIRCUITS-II PAPER-503

MARKS-80

UNIT – I

Power Amplifiers :-Introduction, Difference between voltage amplifier and power amplifier, performance parameters, A.C load line, classification of power amplifiers, class-A amplifier, characteristics, power relationship of class-A amplifier, Transformer coupled class-A Amplifier, class-B amplifier, characteristics, power relationship of class-B amplifier, class-B push-pull amplifier, advantages and efficiency of class-B push- pull amplifier, class-C amplifier, characteristics of class-C amplifier.

UNIT – II

FET Amplifiers:- Introduction, biasing the FET, biasing the JEFT, Gate bias, self bias, setting a Q point, voltage divider bias, source bias, current source bias, biasing the enhancement type MOSFET's, biasing the depletion type MOSFET's small signal low-frequency FET model, small signal High-frequency FET model, FET amplifier, common source amplifier, common drain amplifier, common Gate amplifier.

UNIT – III

Feedback Amplifier :- Introduction, principles of feedback amplifier, advantages and disadvantages of negative feedback, Gain-stability, increased bandwidth, decreased distortion, decreased noise, types of feedback connection, voltage-series feedback connection, voltage-shunt feedback connection, current-series feedback connection, current- shunt feedback connection, comparison of feedback connections, negative feedback in transistor amplifiers, common-emitter amplifier. Without emitter Bypass capacitor, emitter follower, negative feedback in multistage amplifier.

UNIT – IV

operational Amplifier :- Introduction, operational overview, op-amp supply Voltage, IC identification, Op-amp packages, Op-amp parameters, op-am as a voltage amplifier, inverting amplifier, Non-Inverting amplifier, the voltage follower, summing amplifier, differential amplifier op-amp frequency response, frequency vs. gain characteristics of an op-amp. Op-amp applications: comparators, the integrator. The differentiator, audio amplifier, op-amp based oscillator circuits.

UNIT – V

Regulated power supply :- Introduction, voltage regulator, types of voltage regulators;-Zener diode shunt regulator and its working, Disadvantages of Zener diode shunt regulator, transistor shunt regulator, transistor series regulator, transistor current regulator, op-amp series regulator, op-amp shunt regulator.

TEXT BOOKS:

1. **Electronic circuits by R.S. Sedha (S. Chand)**
2. **Electronic Device & Circuits by M.L. Anand**
3. **Electronic Devices by Boylestad.**
4. **Text Book of Electronics by Prof. B.B Swain**

PROGRAMMING IN ‘C’ PAPER-504

MARKS-80**UNIT-I**

Introduction to C-compiler, ASCII characters, Identifiers, Program structure, Key words, Syntax, I/O statements, Escape Sequence, Application of words [void, main, return, include, getch, delay etc.], Preprocessor, Macro, Storage Class of Variables

UNIT-II

Assignment Operators, Arithmetic Operators, Logical Operators, Bitwise Operators, Conditional Operators, Special Operators, Conditional statements if, if-else, nested if-else, switch, case, break continue, goto,

UNIT-III

Loops(while, do-while, for), Array(1-D,2-D), Sorting Techniques [Binary, Insertion, Selection, Bubble, Merge, Quick], Function, Pass by Value, Pass by Reference, Recursive function

UNIT-IV

Pointer, Pointer to Array, Pointer to Function, Structure, Pointer to structure, union, enum, typedef.

UNIT-V

Stack-Insertion, Deletion, traverse(Array implementation), Prefix to Postfix notation, Postfix Evaluation, Queue-Insertion, Deletion, Traverse(Array Implementation), Linked List(Single, Double), Tree [Binary, B-tree], Searching and Shortest Path algorithm [BFS,DFS]

TEXT BOOKS:

1. **Programming in ANSI C by E.Balguruswamy**
 2. **Data Structure using C by Radha ganeshan**
 3. **Data Structures by Seymour Lipschutz**
 4. **Let us ‘C’ by Kanitkar**
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COMMUNICATION LAB PAPER-505

MARKS-50

1. Study of DSB-SC Transmitter
2. Study of DSB-SC Receiver
3. Study of SSB-SC Transmitter
4. Study of SSB-SC Receiver
5. Study of Telephone Circuits
6. Study of B/W Television
7. Study of Color Television.
8. Study of Video system.
9. Study Of LCD Projector

'C' PROGRAMMING LAB PAPER-506

MARKS-50

1. Programs using console I/O and standard I/O routines
 2. Programs illustrating Operators
 3. Programs illustrating escape sequences
 4. Programs illustrating storage class.3
 5. Programs for conditional statement "if", "if-else" and "nested if-else"
 6. Programs for control loop "while"
 7. Programs for control loop "do-while"
 8. Programs for control loop "for"
 9. Programs for switch-case concept
 10. Programs for goto and continue and break concepts
 11. Programs using one dimensional array
 12. Programs using two dimensional array
 13. Programs using array of characters
 14. Programs using pointer
 15. Programs using pointer string
 16. Programs using pointer to array
 17. Programs using function concepts
 18. Programs using pointer to function
 19. Programs using union
 20. Programs using structure
 21. Programs using pointer to structure
 22. Programs using file I/O routines
 23. Programs for matrix arithmetic
 24. Programs for searching techniques
 25. Program for sorting techniques
 26. Programs for Tree traversal
 27. Programs for stack and queue operations
 28. Programs for shortest path algorithms
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SEMESTER-VI
COMPUTER ARCHITECTURE
& OPERATING SYSTEM
PAPER-601

MARKS-80

UNIT-I

Micro Computers, Parallel Computing Models, Multiprocessors, Multicomputers, Multi vector and SIMD Computers and Development Tracks, Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanism, System Interconnect Architectures, Performance Matrices and Measures, Parallel Processing Application, Speedup Performance Laws, Scalability Analysis and Approaches,

UNIT-II

Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology
Backplane Bus System, Cache Memory Organization, Shared Memory Organization, Sequential and Weak Consistency Models

UNIT-III

Linear Pipeline Processors, Non-linear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar and Super-pipeline Design
Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Three Generations of Multicomputers, Message Passing Mechanism,

UNIT-IV

Vector Processing Principles, Multi-vector Multiprocessors, Compound Vector Processing, SIMD Computer Organizations, The Connection Machine
Latency Hiding Techniques, Principles of Multi Threading, Fine-Grain Multicomputers, Scalable and Multithreaded Architectures, Data Flow Architectures

UNIT-V

Parallel Programming Models, Parallel Language and Compilers, Dependence Analysis of Data Array, Code Optimization and Scheduling, Loop Parallelization and Pipelining
Parallel Programming Environment, Synchronization and Multiprocessing Modes, Shared Variable Program Structure, Message Passing Program Development, Mapping Programs onto Multicomputers
Basic Concepts Of UNIX and LINUX.

TEXT BOOKS:

1. **Advance Computer Architecture by Kai Hwang**
2. **Computer Organization by Hamachar**

MULTIMEDIA TECHNIQUES
PAPER-602

MARKS-80

UNIT-I

Introduction to Multimedia, Need For Multimedia, Global Structure, Media And Data Streams: Perception Medium, Representation Medium, Presentation, Storage, transmission and Information Exchange Medium, Multimedia In Education, Multimedia hardware and Software Products.

UNIT-II

Introduction to Sound and Audio: Basic Sound Concepts (Computer Representation Of Sound, Audio Formats) Music (MIDI Basic Concepts, MIDI Devices, MIDI Message, MIDI Software's) speech (Speech Generation & Speech Transmission)

UNIT-III

Introduction To Image & Graphics. Basic Concepts, Digital Image Representation, Image Format, Graphics Format, Image Processing criteria, (Synthesis, analysis, Transmission)

UNIT-IV

Introduction To Video & Animation:

Basic Concepts: Video Signal Representation, Computer Video Format, Television: Conventional Systems, High Definition System, Transmission, Computer based Animation: Basic Concepts, Method Of Controlling animation, Display Animation.

UNIT-V

Multimedia Data Compression Issues:

Storage space, coding requirement JPEG: Image Preparation, Loss Less Mode, Hierarchical Mode, MPEG : Video encoding , Audio encoding, Data Stream, Multimedia Application : Introduction, Media Preparation, Composition & Integration.

TEXT BOOKS:

1. Multimedia Computing, Communication & Application
2. By Ralf Stein Metz & Klara Nabrstedt
3. Multimedia Systems By John F.Koegal Buford
4. Multimedia in Practice : Technology & Application By Judith Jeffcoate(PHI)

MEASUREMENT SYSTEMS & TRANSDUCERS

PAPER-603

MARKS-80

UNIT-I

Measurement standards and meters :- Accuracy and Precision, Significant Figures, Error, Types of error, Statistical error, Probability errors, Limiting errors

International, Primary, Secondary and Industrial standards, Importance and application of standards of measurements, Calibration, rationalized MKS units, dimensions of physical quantities

UNIT-II

Transducers :- Definition of transducer, Primary and secondary of transducers, Classification, Principles, Application and advantages of Electric and Electronic transducers, Linear, Nonlinear and Digital potentiometers

Thermocouple, LVDT, Strain gauge, Thermistor, Capacitive transducer, Hall-effect transducer, Opto-electronic transducers, Temperature transducers, Piezo-electric transducers

UNIT-III

Measurement Systems :- Construction, Principles and Working of Galvanometers, Chopper type DC voltmeter, Analog digital Multimeter, Measurement of AC and DC Voltages, Current and Resistance.

UNIT-IV

Bridges and Signal Generators :- DC and AC bridges, Wheatstone bridge, Kelvin Double bridge, Maxwell's Inductance Bridge, Hay's bridge, Capacitance comparison bridge AF and RF Signal Generators, RF Sweep Generator, Function Generator and Pulse Generator

UNIT-V

Principles and types of electronic emissions, Construction & operation of CRT, Block diagram of CRO, Focusing and Deflection, Time Base generator, Triggering Circuit, Dual trace CRO, Storage CRO, Sampling CRO

TEXT BOOKS:

- 1) Electrical and Electronics Measurement & Instrumentation by A.k. Sawney

- 2) Electronic Measurement Systems by Kalsi.
- 3) Measurement By Cooper & Helfaick (PHI)

MULTIMEDIA LAB PAPER-604

MARKS-50

1. Adobe Photoshop
2. Sound Forge
3. Adobe Premier
4. Macromedia Director
5. 3D- MAX
6. FLASH

SEMINAR PAPER-605

MARKS-50

PROJECT -I PAPER-606

MARKS-100

Every student will have to do project report in any area of Electronics & Telecommunication detailed in the curriculum under the guidance of regular / guest faculty/ Industry experts. It should be research based to create new knowledge in any area of Electronics & Telecommunication. The student shall submit the project report before the Term – End examination. Marks will be awarded (out of 100) for the project report after viva internally.

Mark Distribution:

- | | | |
|---------------------------|---|----|
| 1) Project Demo | - | 30 |
| 2) Project Report | - | 20 |
| 3) Presentation / Seminar | - | 25 |
| 4) Viva | - | 25 |

SEMESTER-VII ELECTROMAGNETIC WAVES & ANTENNA THEORY PAPER-701

MARKS-80

UNIT-I

The Co-ordinate Systems; Rectangular, Cylindrical, and Spherical Co-ordinate System. Co-ordinate transformation. Their Physical interpretation. The Laplacian. Divergence Theorem, Stokes' Theorem. Useful Vector identifies .

UNIT-II

Electrostatics : The Potential Gradient. The Electric dipole. The Equipotential surfaces. Energy stored in an electrostatic field. Boundary Conditions. Capacitors and Capacitances. Poisson's and Laplace's equations. Solutions of Simple Boundary value problems. Method of Images.

Magnetostatics: The Biot-Savart law. Amperes' Force Law . Torque exerted on a current carrying loop by a magnetic field. Gauss's law for magnetic fields. Magnetic Vector Potential . Magnetic

Field Intensity and Ampere's Circuital law. Boundary conditions. Magnetic Materials . Energy in magnetic field . Magnetic circuits.

UNIT-III

Maxwell's Equations from Ampere's and Gauss's Laws. Maxwell's Equations in Differential and Integral forms; Equation of Continuity. Concept of Displacement Current. Electromagnetic Boundary Conditions.

Poynting's Theorem , Time – Harmonic EM Fields . Application to Transformer.

UNIT-IV

Plane wave Propagation : Helmholtz wave Equation. Plane wave solution. Plane wave propagation in lossless and lossy dielectric medium and conducting medium . Plane wave in good conductor, surface resistance , depth of penetration. Polarization of EM wave - Linear, Circular and Elliptical polarization. Normal and Oblique incidence of linearly Polarized wave at the plane boundary of a perfect conductor, Dielectric – Dielectric Interface. Reflection and Transmission Co-efficient for parallel and perpendicular polarizations , Brewster angle.

UNIT- V

Antennas : Physical Concept of radiation from an antenna. Wave equations in terms of Potential Functions. The Concept of retarded Vector Potential . Hertzian Dipole: Near Zone Fields, Radiation Fields, Radiation resistance, Directive gain and Directivity. A Magnetic Dipole. A Short dipole Antenna. The Half wave Dipole Antenna. Monopole Antenna. Pattern Multiplication Antenna Arrays, Linear Arrays. Antenna types(Horn, Helical,yagi,log periodic,disc)

TEXT BOOKS:

1. Electromagnetic Field Theory, Fundamental by B. S. Guru & Huseyn
2. Electromagnetic fields & Antenna Theory by J.D.Krauss
3. Electromagnetic waves and Radiating Systems E. C. Jordan & K. G. Balmin, 2nd Edition. PHI Pvt. Ltd.
4. Electromagnetic fields by W.H.Hayt Jr.
5. Electromagnetic Theory by Saddique.
6. Antenna Theory by K.D. Prasad.

PULSE & DIGITAL CIRCUITS PAPER-702

MARKS-80

UNIT-I

Linear wave shaping: Low pass RC Circuit(sinusoidal ,step voltage, pulse input, square wave, ramp input, exponential input),High pass RC circuit(sinusoidal, step voltage, pulse input, square wave, ramp input, exponential input),RL Circuit, RLC circuit.

Non Linear wave shaping: Diode clippers, shunt clippers, series clipper, comparators
Clamping circuit: Negative clamper ,positive clamper ,biased clamper

UNIT-II

Active Filters: - First & Second order low pass / high pass, band pass, band reject, and all pass filters. Universal active filter design. Wien Bridge oscillator, sawtooth wave generator OP Amps. Voltage Controlled Oscillator.

UNIT-III

Bistable Multivibrator :- Stable States, Fixed Biased and Self-biased Transistor binary, Commutating capacitors, Symmetrical / Unsymmetrical triggering, Schmitt trigger Circuit. Cathode coupled Binary, Emitter coupled Binary The Monostable Multivibrator: Gate width Collector coupled, wave forms triggering. Emitter- coupled Monostable Multivibrator.

Astable – **Multivibrator:** - Emitter coupled, Collector coupled, Wave forms.

UNIT – IV

Negative Resistance Switching Circuits :- Tunnel Diode operation and characteristics, Monostable Astable, Bistable circuits using tunnel diode , Voltage controlled Negative Resistance Switching Circuits.

UJT operation and characteristics . Application of UJT to generate Saw tooth waveform .

UNIT - V

Analysis & Design of: - Voltage time base generator. Current time base generator
Instrumentation Amplifier, IC 555 & 556 Timer , Phase Locked Loop(IC565, 566)

TEXT BOOKS:

1. Pulse, Digital and switching Waveforms - Jacob Millman and Herbert, Taub (TMH Publication).
2. Pulse and Digital Circuits by A. Anand Kumar, PHI
3. OP-Amp & Linear Integrated circuit by Ramakanta A. Gayakward.

OPTICAL FIBER & SATELLITE COMMUNICATION PAPER-703

MARKS-80

UNIT-I**OPTICAL COMMUNICATION :**

Int. to optical communication, principles of light transmission , optical fiber modes and configuration , Optical sources, L.E.D's, LASER Diodes, Modal Reflection Noise, Power Launching & Coupling, Population Inversion, Fiber splicing, optical connector , photo detector, PIN, Avalanche, Detector Responsivity Time, Avalanche Multiplication Noise.

UNIT-II

Signal Degradation in optical fibers, Attenuation losses, signal distortion in optical waveguides, material dispersion, chromatic dispersion, Intermodal distortion, pulse broadening in graded-index fibers, mode coupling, Advance fiber design: Dispersion shifted , Dispersion flattened, Dispersion compensating fiber, Design optimization of single mode fibres.

Coherent optical fiber communication, Modulation Techniques, Misalignment, Fiber to Fiber joints.

UNIT-III

WDM concepts and components, operation, Hologram, Tunable Filters, Directional coupler, Dispersion Management. Optical Amplifiers – EDFA, Photonic Switching,. Optical Networks – SONET/SDH, Optical Interfaces, Ring Topology, Star Architecture

UNIT-IV:

Evolution of Satellite Technology, Communication Satellites, Satellite frequency Bands. Orbit of communication satellite -Satellite Constellation - Orbital parameters, Orbital perturbations, Geo stationary orbits ,Low Earth and Medium orbits te Channel analysis, cross-links, Carrier to Noise ratios, Frequency reuse with spot beams. Multiple beams. Satellite front end, Front-end noise. Noise temperature, Front end filters. Satellite multiple access methods. FDMA, TDMA, CDMA Systems.

UNIT-V

Antennas : Antenna patterns. Gain. Half power beamwidth. Efficiency. Sidelobesncy hopped CDMA, Satellite jamming, Code acquisition and tracking Rain Loss. Rain attenuation. Crane rain model. Effect on G/T. Frequency dependence Satellite applications. Data Communication and VSAT network. Mobile satellite services (GEO and NONGEO).

TEXT BOOKS:

1. G. Keiser, “ Optical Fiber Communication (3rd Edition) “, Mc Graw Hill International, 2000.
2. A. Ghatak and K. Thyangarajan, “Int. to fiber optics”Cambridge University press, 1998.
3. “Satellite Communication”, Dennis Roddy PHI

4. Richharia, M. Satellite communication
5. Satellite communication by Timotty Pratt.
6. Optical Fibre Communication by Senior. (PHI)
7. Satellite Communication by D.C. Agarwal.

RDBMS WITH SQL SERVER

PAPER-704

MARKS-80

UNIT-I

Database System Architecture - Data Abstraction, Data Independence, Data Definitions and Data Manipulation Languages. Data models - Entity Relationship(ER), Mapping ER Model to Relational Model, Network .Relational and Object Oriented Data Models, Integrity Constraints and Data Manipulation Operations.

UNIT-II

Relation Query Languages , Relational Algebra, Tuple and Domain Relational Calculus, SQL and QBE. Relational Database Design: Domain and Data dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless design, Comparison of Oracle & DB2.

UNIT-III

Query Processing and Optimization : Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Optimization Algorithms.

UNIT-IV

Storage Strategies : Indices, B-Trees, Hashing, Transaction processing: Recovery and Concurrency Control, Locking and Timestamp based Schedulers, Multiversion and Optimistic Concurrency Control Schemes.

UNIT-V

Advanced topics: Object-Oriented and Object Relational databases. Logical Databases, Web Databases, Distributed Databases, Data Warehouse and Data Mining.

TEXT BOOKS:

1. Elmaski & Navathe -Fundamentals of Database Systems, 4th Edition,Pearson Education
2. C.J.Date - An introduction to Database Systems, Pearson Education
3. Bipin Desai -An introduction to Database System, Galgotia Publication.

LINEAR IC & APPLICATIONS

PAPER-705

MARKS-80

UNIT-I

Integrated Circuits-Analog, Digital, Hybrid - Introduction to operational amplifiers - Basic differential amplifier - dual input balanced output and unbalanced output- Internal block schematic of op amp - Biasing used in IC- Constant current source- - Op-amp parameters - ideal op amp - transfer curve - equivalent circuit- Internal circuit analysis of a typical op-amp -Open loop gain -input and output impedance - Frequency response, frequency compensation. Slew rate and its effect, typicaldatasheet741.

UNIT-II

Input bias current -offset - drift - compensating networks, finite gain bandwidth and its effect in op amp circuits performance .Open loop configurations Op amp in closed loop configuration : Different feed back configurations- Voltage series feedback and voltage shunt feedback -

UNIT-III

Op amp applications- CMRR,SVRR Summer- Subtractor- Log amplifier- Antilog amplifier- Integrator and differentiator, Instrumentation amplifier
concept of virtual ground- voltage follower - V/I converters, I/V converters and its applications - Differential amplifiers with one op amp and 3 op amps- Use of offset minimizing resistor (ROM) and its design.

UNIT-IV

zero crossing- using voltage reference- regenerative (Schmitt trigger) comparators, window detector application - OP as comparators Voltage regulators-723 (block diagram, typical low voltage regulator circuit), 78XX,79XX,317.

Wien bridge oscillator, Swatooth wave generator OP-Amps ,voltage controlled oscillator.

UNIT-V

Specialized ICs and applications: 555 timers - Mathematical block diagram Derivation of capture range , lock range and pull in time capture and lock range- 565 PLL - PLL applications: Frequency multiplication and division- AM demodulation- FM detection- FSK demodulation Analog multiplier circuits and applications. ADC and DAC - performance specification -weighted, R-2R; successive approximation,flash, integrating.

TEXT BOOKS:

1. Op amps and Linear Integrated circuits: R F Coughlin – Pearson Education/PHI
2. Op-amps and Linear integrated Circuits: Gaykwad

References:

1. Integrated Electronics by Milliman Haykin.

ADVANCED COMMUNICATION LAB PAPER-706

MARKS-50

1. Measurement of Refractive Index profile, Numerical Aperture attenuation and dispersion in a multimode optical fiber.
2. Establishing and Testing an optical Fiber Communication Link.
3. Designing an optical fiber communication link to a given specification.
4. Simulating TDM and WDM.
5. Multivibrator design (simulation using transistors / P-SPIC or any software).
6. Amplifier Design (2 stage, 3 stage) obtain Frequency Response / P-SPIC or any software.

RDBMS LAB PAPER-707

MARKS-50

1. Use of SQL syntax :creation.
2. Use of SQL syntax : Insertion.
3. Use of SQL syntax : Deletion.
4. Use of SQL syntax : Updation.
5. Use of SQL syntax : Join.
6. Converting ER Diagram into RDBMS
7. PL/SQL Programming ,view ,store procedure ,cursor and trigger(creation, Execution and deletion)

SEMESTER-VIII
SOFTWARE ENGINEERING
PAPER-801

MARKS-80

UNIT-1

Evolution & Impact of software Engineering, Programs VS. Software products, software life cycle Model, Classical Waterfall Model, Prototyping Model, spiral Model, Comparison of different life cycle model.

Software Project Management: - Project planning metrics for project size estimation, Estimation Techniques, Scheduling, organization & Team structure, staffing, Risk management.

UNIT-II

Software Design: - Cohesion and coupling, Neat arrangement, S/W design approaches, Object Oriented VS. Function oriented design.

Function Oriented S/W Design: - Structured Analysis, Data flow Diagram, Structured Design, Details design & design review.

Object Modeling using UML: - Overview of object oriented concepts, Unified Modeling Language (UML), UML Diagrams, Class diagrams.

UNIT-III

Object Oriented S/W Development: - Design Patterns, Design process

User Interfaces Design: - Characteristics of a good user interface, basic concepts, Types of user interface, component based GUI development (Window system only), User Interface Design Methodology.

UNIT-IV

Coding & Testing: - Introduction to coding, code review, Testing, Unit Testing, Black box Testing, White Box Testing, Debugging, Integration Testing, system Testing.

Software Reliability & Quality Management: - Software Reliability, S/W quality management system, ISO 9000. Personal software process, six sigma.

UNIT-V

Computer Aided S/W Engg :- Case & its scope, Case environment, Case support in S/W Life cycle, other characteristics of case Tools, Architecture of a Case Environment

Software Maintenance:- Characteristics, software reverse engg, maintainance process Model, estimate of maintenance cost.

Software Reuse :-Basic issues, reuse approach, reuse at organization level.

TEXT BOOKS:

1. Fundamentals of software Engineering – Rajib Mall. (PHI – 2nd Edition) .
2. Text book on software Engineering –Rohit Kurahna (Vikash)

DATA COMMUNICATION & NETWORKING
PAPER-802

MARKS-80

UNIT-I

Overview of Data Communications and Networking : Analog and Digital, Analog Signals, Digital Signals, Analog versus Digital, Data Rate Limits, Transmission Impairment, More about signals.

Transmission mode, Transmission Media: Guided Media, Unguided media (wireless)

Digital Transmission : Line coding, Block coding

UNIT-II

Overview of OSI Model, Data Link Layer Error Detection and correction : Type of Errors, Detection, Error Correction Data Link Control and Protocols: Flow and error Control, Stop-and-wait ARQ, Go- Back. N ARQ, Selective Repeat ARQ, HDLC.

UNIT-III

Point-to – Point Access : PPP Point –to- Point Protocol, PPP Stack,
Multiple Access : Random Access, Controlled Access, Channelization.

UNIT-IV

Local area Network : Ethernet, Traditional Ethernet, Fast Ethernet, Gigabit Ethernet. Wireless LANs: IEEE 802.11, Bluetooth virtual circuits: Frame Relay and ATM. Network Layer : Host to Host Delivery: Internetworking, addressing and Routing Network Layer Protocols: ARP, IPV₄, IPV₆, ICMP and ICMPV₆ Transport Layer : Process to Process Delivery : UDP; TCP congestion control and Quality of service.

UNIT-V

Application Layer : Client Server Model, Socket Interface Domain Name System (DNS):
Electronic Mail (SMTP) and file transfer (FTP) HTTP and WWW.
Security : Cryptography, Message security, User Authentication.

TEXT BOOKS:

1. Data Communications and Networking : Third Edition. Behrouz A. Forouzan
Tata Mc Graw-Hill Publishing company Limited.
2. Computer networks by William Stallings .
3. Computer Network by A.S. Tannenbum

CONTROL SYSTEM PAPER-803

MARKS-80

UNIT-I

Basic concepts of control system, open loop and closed loop systems, difference between open loop and closed loop systems, classifications

Mathematical model of physical systems, transfer function, block diagram algebra, single flow graph (SFG), Mason's gain formula, application of SFG to control systems

Feed back theory,: Types of feedbacks, effects of degenerative feedback on control system , regenerative feedback.

UNIT-II

Time domain analysis: standard test signals: step ramp, parabolic and impulse signals. Time response of 1 & 1 order systems to unit step and unit ramp inputs. Time response of second order systems to unit step input. Time response specifications steady state errors and error constants of different types of control systems generalized error series method.

Concepts of stability: Necessary conditions of stability, Hurwitz stability criterion, routh stability criterion, application of routh stability criterion to linear feed back systems, relative stability.

UNIT-III

Root locus techniques: Root locus concepts, rules for construction of root loci, determination of roots from root locus, root contours, systems with transportation lag

Frequency domain analysis: Introduction , Bode plots, Determination of stability from Bode plots, Polar plots, Nyquist Stability criterion, application of Nyquist stability criterion to linear feed back

systems. Closed loop frequency response: Constant M circles, Constant N Circles constant m circles, use of Nicolas chart

UNIT-IV

State variable analysis: introduction, concept of state variables, state vector, input and output vector, general state model representation of linear time invariant, SISO and MIMO systems and their block diagram representations, state model representations of physical systems Components: A.C Servo motor, DC servo motor, AC techo meter, synchros, stepper motor

UNIT-V

Digital control system: introduction to digital control system, shanon's sampling theorem, signal reconstruction, transfer function of ZOH, the z-transforms of various functions, inverse z transform, properties of z-transform, solution()n of difference equations, the pulse-transfer function of linear feedback systems.

TEXT BOOKS:

1. Control Systems Engineering by L.J. Nagrath, M. Gopal, Third Edition, New Age International Publishers.
2. Modern Control Engineering by K. Ogata, PHI
3. Modern Control Engineering by D. Roy Choudhury, PHI

REFERENCE BOOKS:

1. System Dynamics and Control: Eroni Umez Erani, PWS Publishing, International Thompson Publishing Company
2. Control System, Theory & Applications by Sama_it Ghosh, Pearson Education

MICROWAVE TECHNOLOGY & RADAR PAPER-804

MARKS-80

UNIT – I

Introduction to Microwave :- History, microwave region & band descriptions, advantages of microwave, applications of microwave.

Electromagnetics: - Introduction, Maxwell's equation, amperes law, faradays law, gauss's law.

Transmission Lines:- Introduction, two wire parallel transmission line, voltage & current relationship, characteristic impedance, reflection co-efficient, propagation constant, input impedance, standing waves, voltage standing wave ratio, impedance at a voltage minimum & at a voltage maximum, impedance matching, stub matching, problems.

UNIT – II

Waveguides (single line) , types of wave guides , propagation of waves in rectangular wave guide , propagation of TEM waves, TE and TM modes, propagation of TM waves in rectangular wave guide , Boundary conditions , Guide wavelength , Group velocity and phase velocity, expression for phase velocity and group velocity, relation between TM modes in rectangular waveguide, propagation of TE waves in a rectangular wave guide , Te modes in rectangular wave guide.

UNIT – III

Semiconductor Microwave Tubes:- Klystrones : (Two cavity, reflex), magnetrons

Semiconductor Microwave Devices:- Introduction, varactor diodes : construction, equivalent ckt & applications, parametric amplifier, PIN diode : operation & applications, schottky barrier diode, tunnel diode, gunn diode, IMPATT diode, MASER & Laser.

UNIT – IV

Microwave Communication Systems:-Introduction, propagation modes, microwave systems, analog microwave communication (LOS system, OTH system, transmission interference & signal damping, duet propagation, fading i9n troposphere and its effect on troposcatter propagation, digital

microwave communication microwave antenna (Horn antenna, parabolic reflectors, lens antenna)

UNIT – V

Radar Fundamentals:- Introductions; Basic concepts, Advantages, limitations, applications, Block diagram of a simple radar, classification (continuous wave and pulsed radar), radar range equation, factors affecting range of a radar, pulsed radar system, radar receivers, plan position indicator, scanning & tracking with a radars, CW doppler radar, moving target indicator (MTI) radar, radar antennas, problems.

TEXT BOOKS:

1. Microwave & Radar Engineering – by M. Kulkarni
2. Microwave & Radar Systems – by A.K. Maini.
3. Microwave Engg. - by Sanjit Mitra (TMH)

REFERENCE BOOKS:

1. Principles of Microwave Engineering By Reich, Oudong and Others.
2. Microwave Device and Circuit, 3rd Edition, Sammuel Y., Liao, Perason

OBJECTS ORIENTED PROGRAMING WITH JAVA PROG PAPER-805

MARKS-80

UNIT – I

Fundamentals of Object – oriented programming. Introduction, concepts of object – oriented programming: Object & Classes, data abstraction & encapsulation, Inheritance, Polymorphism, Dynamic binding & message communication. Introduction to Java, Java features, hardware & software requirements, java environment. An overview of Java : Simple java program, JVM, command line arguments, constants, variables, data types, arrays, operators, control statements (Branching & Looping).

UNIT – II

Classes, Objects & Methods :- Introduction, defining a class, adding variables, methods, creating objects, constructors, method overloading, this keyword, garbage collection, finalize () method, access control (static, final), Nested & inner classes. Inheritance: Basics, superclass & subclass, method overriding, abstract classes, final classes. Package :- Introduction, Java API packages, creating package, accessing & using a package. Interfaces :- Introduction, defining interfaces, extending interfaces, implementing interfaces.

UNIT – III

Multithreaded Programming :- Introduction, creating threads, extending the thread class, stopping & blocking thread, lifecycle of a thread .Exception Handling:- Exceptions, types of exceptions, try & catch, throw, throwe, finally Strings:- Strings constructors, length, operations, character extractions, comparison, searching, modifying, string buffer class, string tokenizer & date class.

UNIT – IV

Java . lang:- Number, character, math & throwable. **Java. io :-** Introduction, concept of stream, stream classes, byte stream classes ; Input stream, output stream, character stream : reader stream, writer stream. **Java.applet :-** Introduction, applet lifecycle, passing parameters to applets.

Graphics Class :- Introduction, graphics class, line & rectangles, circle & ellipses, ace drawing, drawing polygons, font settings.

UNIT – V

Java . awt :- Text component class, text field, scroll bar, text area, menubar & menu class, button class, label class, applet with buttons and labels, buttons in action, check box, check box group,

choice class, list menu. **Event Handling** :- Event classes, event listener, key events, mouse event.

Java Database Connectivity :- Introduction, JDBC Driver, statements, caching database results.

TEXT BOOKS:

1. Programming with Java - E. Balagurusamy.
2. Programming with Java2 - C. Xavier.

REFERENCE BOOKS:

1. Java 2 Complete reference (TMH)

DATA COMMUNICATION LAB PAPER-806

MARKS-50

1. Study of Pulse Code Modulation
2. Study of Time Division Multiplexing
3. Study of Frequency Division Multiplexing
4. Study of Wave Division Multiplexing
5. Study of Telephone Circuit
6. Measurement of Characteristic impedance of a transmission line
7. Measurement of Reflection Co-efficient
8. Study of Local Area Network (LAN)

OOP'S(JAVA) LAB PAPER-807

MARKS-50

1. Programs on concept of classes and objects.
2. Programs using inheritance.
3. Programs using polymorphism.
4. Programs on use of operator overloading.
5. Programs on use of object management.
6. Programs on exception handling and use of templates
7. Programs on File handling in JAVA.
8. Design problem on stock and accounting of a small organization, railway reservation, payroll preparation and optimization problem.

SEMESTER-IX INTERNET & WEB TECHNOLOGY PAPER-901

MARKS-80

UNIT – I

Introduction to communication: Dial-up connection, ISDN connection, DSL connection, client server model & Introduction to Internet: Modem, characteristics of a modem, connectivity for es.

Protocol: SMTP, POP3, PPP / SLIP, TCP / IP, HTTP, FTP, WAP, internet IP Address, Domain name, browser, URL, internet services, electronic mail & its advantages & disadvantages, World Wide Web, E-commerce & Electronic Data Interchange (EDI)

UNIT – II

Introduction to HTML, HTML tags, documents, header section, body section, headings, formatting

characters (text), font tag, image & pictures, listing, link documents using anchor tag, table handling in HTML, creating frames & forms (Frameset definition, frame definition, nested frameset, HTML forms, elements of a form).

UNIT – III

Introduction to JavaScript, client-side JavaScript and server-side JavaScript, advantages of JavaScript, writing JavaScript into HTML, Elements of JavaScript: Data types, variables, operators, conditional statements, array objects, date objects, string objects

Objects & Events: Document object, Image object, forms & elements, event handling & data validation

Functions in JavaScript :(Built in function, declaring functions, passing parameters, recursive functions) Dialog boxes: (Alert, prompt, & confirm dialog boxes).

UNIT – IV

Introduction to servlet (Servlet Environment and role, Using java Web Server, Servlet API, The Servlet Life Cycle, Welcome Servlet , Servlet context, HTTP Support, HTML to Servlet Communication) Introduction to JSP, Client responsibility, server responsibility, JSP architecture, JSP server, JSP tags, request object, response object, business processing with JSP.

JSP with JDBC : creating ODBC data source, introduction to JDBC, prepared statement class, reading from database table, resultset class , extracting data from resultset object, creating new row in a table ,update data in a table & deleting rows from the table, Examples.

UNIT – V

Introduction to XML, why XML?, XML development goals, understanding the specs, XML in Netscape and in Internet explorer, XMLs syntax and structure rules, Document type declaration , XML and data binding ,adding records to a data Island, examples, XML's style language, converting html document into XML documents.

TEXT BOOKS:

1. Unit- I, II, III & IV ——— Web Technology & Design by C. Xavier.
2. Unit-,V ———Web Technologies (part-I) by Ivan Bayross (BPB)

DIGITAL SIGNAL PROCESSING PAPER-902

MARKS-80

UNIT – I

Discrete Time Signals and System : Discrete Time Signals (Elementary examples , classification : periodic and a periodic Signals energy and Power signals , Even and Odd Signals) **Discrete Time System** : Block diagram representation of discrete time systems, classification of discrete time systems time variant and time – invariant, linear and non-linear, casual and anti-casual, stable and unstable.

UNIT-II

Analysis and response (convolution sum) of discrete - time linear LTI system, Recursive and Non-recursive discrete time system. Constant coefficient differences equations and their solutions, impulse response of LTI system , structures of LTI systems Recursive and Non-recursive realization of FIR system.

UNIT-III

The Z transform : The Z-transform and one-sided Z-transform, properties of Z-transform , inverse of the Z-transform , Solution of difference equations.

The Discrete Fourier Transform :The DFT and IDFT, relationship , DFT with Z- transform , the DFT as a linear transformation Relationship of DFT with Z-transform , properties of DFT: periodicity, linearity, summery and time reversal of a sequence..

UNIT-IV

Circular convolution, and correlation by DFT method, Overlap add and save filtering by DFT method
Fast Fourier Transform : Operation counts by direct copulation of DFT, Radix – 2 FFT algorithm-
 Decimation –in-time (DIT) and Decimation – in frequency (DIF) algorithm, Efficient computation
 DFT of Two real sequences , Efficient Computation of DFT of a 2 N-pt real sequences.

UNIT – V**Design and Digital Filters:**

Casually and its implication, Design of linear phase FIR filters using different windows. Design of
 IIR filters – Impulse Invariance Method and Bilinear transformation method.

Implementation of Discrete Time System structure of FIR systems – Direct form, cascaded form.
 Structure IIR Systems - Direct form I & II realizations

TEXT BOOKS:

1. Digital Signal Processing – Principles, Algorithms and Applications by J. G. Proakis and D. G. Manolakis, 3rd Edition, Pearson.
2. Digital Signal Processing by S. Salivahanan, TMH

REFERENCE BOOKS:

1. Digital Signal Processing – schaums Outlines series
2. DSP by Ramesh babu3.DSP by Oppen Ham & Shaffer
3. DSP by Oppen Ham & Shaffer

ADVANCED MICROPROCESSOR & MICROCONTROLLER PAPER-903

MARKS-80**UNIT-I**

Intel 8086 Architecture, -Memory address space and data organization- Segment registers and memory
 segmentation -I/O address space-Addressing modes- Comparison of 8086 and 8088. Basic 8086/
 8088 configuration- Minimum mode-Maximum mode-System timing-Interrupts and interrupt priority
 management

UNIT-II

8086 programming: 8086 Instruction set. Program development tools: editor, assembler, linker,
 locator, debugger and emulator. Architecture of 32 bit Microprocessors: Intel 80386 Architecture
 -Special 80386 Registers -Memory management - interrupts and exceptions - management of tasks
 -Real, protected and virtual 8086 mode- Introduction to 80486 microprocessor -Architecture -
 Comparison with 80386 processor.

UNIT-III

Advanced Microprocessors: Introduction & comparison to Pentium & Pentium pro architectures:
 Introduction to Pentium II, Pentium III and Pentium 4 processors RISC & CISC concepts - -Super
 scalar architecture -Pipelining -Branch prediction -Instruction and data caches - FPU -Comparison
 of Pentium and Pentium pro architecture.. Properties of RISC Systems Comparison with CISC
 architecture , Architecture of Zilog – 800, Motorola – 6800 .

UNIT-IV

Microcontroller (Architecture and Programming):- Introduction to 8051 Microcontrollers
 (Architecture, Pin description), 8051 Assembly Language Programming (JUMP, LOOP, CALL
 Instructions), I/O Port Programming, 8051 Addressing Modes, Arithmetic & Logic Instructions
 Microcontroller Interrupts and Interfacing to 8255.

UNIT-V

Intel. Pentium Processors (Only features):- Introduction to Pentium Processors, Memory System,
 Input/Output System, Branch Prediction Logic, Floating Point Module, Cache Structure, Superscalar

Architecture.

(only the features of Pentium Processor mentioned above are to be discussed)

Study of micro controller (MCS 51 family- 8051) - Architecture - interfacing of LCD, ADC, sensors, DAC using microcontrollers. Communication standards - serial-RS232, parallel-IEEE 488, USB, AGP.

TEXT BOOKS:

1. 0000 to 8085 – Introduction to Microprocessor for Scientists & Engineers by Ghosh & Sridhar, PHI publication (for Module I to Module – III)
2. Advanced Microprocessor and Peripherals (Architecture, Programming & Interface) by A.K.Roy & Bhurchandi.
3. Microprocessor & Microcontroller by Ajay Deshmukh.

DIGITAL IMAGE & SPEECH PROCESSING

PAPER-904

MARKS-80

UNIT-I

Different stages of Image processing & Analysis Scheme. Components of Image processing System, Multiprocessor Interconnections.

A Review of various Mathematical Transforms. Fuzzy sets and properties: Mathematical Morphology, Wavelet Transform, Perception of colour.

Image Formation: Geometric Model, Photometric Model.

Wavelet Transform, Perception of colour

Image Digitization: A review of Sampling and quantization process. A digital Image.

UNIT-II

Image Enhancement: Contrast Intensification, Smoothing, Image sharpening.

Restoration: Minimum Mean-Square Error Restoration by Homomorphic Filtering.

Image Compression: Schematic diagram of data Compression Procedure, Lossless Compression-Coding .

UNIT-III

Registration: Geometric Transformation. Multivalued Image Processing.

Multispectral Image Processing, Processing of colour images.

The Fundamentals of Digital Speech Processing . Time –Domain Methods for Speech Processing. Time - Dependent processing of speech, Short-time energy and Average Magnitude, Short time Average Zero- Crossing Rate.

UNIT-IV

Digital Representations of Speech Wave form .Sampling speech signals, Statistical Model, Instantaneous quantization, Instantaneous Companding, Quantization for optimum SNR, Adaptive Quantization, Feed-Forward and Feedback adaptations.

UNIT-V

Linear predictive Coding Speech.

Block diagram of simplified Model for speech production, Basic principle of Linear Predictive Analysis – The Auto Correlation Method. The predictive Error Signal.

Digital Speech Processing for Man-Machine Communication by Voice, Speaker Recognitions System-Speaker verification and speaker Identification systems.

TEXTBOOKS: (DIGITAL IMAGE PROCESSING)

1. Digital Image Processing and Analysis by B.Chanda & D.Dutt Majumdar, PHI,2001, Selected persons from Chapter 1-10.

2. Fundamentals of Digital Image Processing by Anil K Jain, Pentice Hall of India-2002.
3. Digital Image Processing- 2nd Edition by Rafael C. Gonzalez and Richard E. Woods, Pearson Education.

ADDITIONAL READING:

1. Digital Image Processing using MAT LAB by R.C. Gonzalez, R.E. Woods and Steven L. Eddins, Pearson Education.

TEXTBOOK: (DIGITAL SPEECH PROCESSING)

1. Digital Processing of Speech Signals by L.R. Rabinu and R.W. Schafer, Pearson Education, Selected portions form Ch. 1,2,4,5,8 &9.

ADDITIONAL READING:

1. Fundamentals of Speech Recognition, by L.Rabiner and Billing-Hwang Juang person Education.
2. Speech Communications, 2nd Edition, by Douglas O' Shaughessy, University, Pune.

VLSI DESIGN PAPER-905

MARKS-80

UNIT-I

Introduction, Historical perspective, VLSI Design methodologies, VLSI Design Flow, Design Hierachy, Design Styles, CAD Technology. Fabrication of MOSFETS, Fabrication processes, NMOS Fabrications, CMOS n-well process, Layout Design rules, Stick Diagrams, Full Custom Mark Layout Design.

UNIT-II

MOS Transistor, Review of structure and operations of MOSFET(n-MOS enhancement type), CMOS, MOSFET v-I Characteristics, MOSFET scaling and small geometry effects, MOSFET capacitance, Modeling of MOS Transistor- Basic concept the SPICE level-1 models, the level-2 and level-3 model equations.

MOS Inverters: Basic NMOS inverters, Characteristic, Inverters with resistive load and with n-type MOSFET load. CMOS inverter and characteristics.

UNIT-III

MOS inverts: Switching characteristic and interconnect effects; Delay time definitions and calculations , Inverter design with delay constraints, estimations of parasitics switching power dissipations of CMOS inverters.

Combinational MOS logic circuits, CMOS logic circuits, State Style, Complex logic circuits, Pass transistor Logic.

UNIT-IV

Sequential Logic Circuit-Introduction, SR latch, Clocked latch & Flip Flop Circuits , CMOS D latch and edge triggered flip flop.

Dynamic logic circuits: Dynamic logic, Basic principles, High performance dynamic CMOS circuits, Dynamic RAM, SRAM, Flash Memory.

UNIT-V

System Design method, Design strategies, Concept of FPGA, Standard cell based design, design capture tools, hardware definition languages such as VHDL and packages. Xlinux(Introduction), Introduction to IRSIM and GOSPL (Open source packages), design verification and testing, simulation at various levels including timing verifications, fault models, design strategies for testing chip level and system level test techniques.

TEXT BOOKS:

1. Digital Integrated Circuits- Analysis & Design – Sung Mo-Kang & Yussuf Leblebici, TMH.
2. VHDL Programming by example – Perry TMH.

REFERENCE BOOKS:

1. Digital Integrated Circuits: A Design Perspective- Rabey et.ai.Pearson Education.
2. VLSI design Techniques for analog and digital circuits- Geiger et.AI.McGraw Hill.
3. VLSI – Puckneln & Eshagraine (PHI)

**DSP MAT-LAB
PAPER-906****MARKS-50**

1. Different types of Signal generation using Matlab. (both continuous and discrete.)
2. Linear & Circular Convolution of two sequences. (Without using the inbuilt function (conv) available in Matlab.)
3.
 - i) Finding Auto correlation of a sequence
 - ii) Finding cross correlation of 2 sequences .
 - iii) Finding power spectral density of a sequence .
4. Finding the convolution of periodic sequence using DFT and IDFT.
5. Implementation of FFT (Fast Fourier Transform) algorithm
 - i) Decimation in Time (DIT)
 - ii) Decimation in Frequency (DIF)
6. Design of FIR filter (lowpass, highpass,bandpass). Using windowing technique (hanning window, hamming, window rectangular window, Kaiser window.
7. Design of IIR filter. (Design of Butterworth Filter Design of Chebyshev filter)
8. Design of Half-Adder.
9. Implementation of NAND & NOR Gates.
10. Characteristic of C-MOS & N-MOS.

LAB. REFERENCE:

Digital Signal Processing a hands –on approach by Schucer C, Mohesh Chgave. (TMH)
DSP – using MATLAB by Sanjit Mitra

**WEB DEVELOPMENT LAB
PAPER-907****MARKS-50**

Internet Concepts & Browsing
HTML programming.
JavaScript /VB script programming.
JSP Programming
Servlet Programming
XML programming.

SEMESTER-X BROADBAND COMMUNICATION PAPER-X-1

MARKS-8

UNIT-I

FUNDAMENTALS CONCEPTS:- Components & Network architecture of Broadband communication system. Cable broadband data network architecture, Importance & Future of broadband telecommunication.

INTERNET BASED NETWORK:- Internet protocol suite, IPv6, applications & services, voice over IP, Internet security.

INTRANET & EXTRANET:- Overview, Intranet Technology, Extranet Technology,. Topology model, Intranet & Extranet applications.

UNIT-II

NETWORKING TECHNOLOGIES:- X.25 Technology, Frame relay, Frame relay vs.x.25, Frame relay applications, Fiber channel Technology & topologies, classes of services, Benefits and applications.

SONET- Signal frame components, topologies advantages applications, and disadvantages, Introduction to SDH.

UNIT-III

Virtual Private Network:- Introduction, types, general architecture, advantages & disadvantages of VPN, VPN security issues.

ISDN & BISDN- ISDN:- ISDN Devices & Interfaces, services, Architecture, applications.

BISDN- Interfaces & Terminals, protocol architecture applications of BISDN.

UNIT-IV

ATM technology: - Introduction, Network, Service classes, applications, advantages & disadvantages.

Digital Subscriber line :- DSL system technology Future of DSL systems & Broadband systems, XDSL standards (ASDL, HDSL, VDSL, SDSL)

Cable Modem systems :- Cable modem technology, External & Internal modem, comparison between Broadband DSL and Cable modem Technology.

UNIT-V:

Wireless LAN: Physical layer & Topology, Technologies, Applications.

Wireless ATM :- Overview & Architecture of ATM. Wireless PAN, Wimax

Network Management & Security: - Network management architecture, protocol, simple Network Management protocol (SNMP)

Network Security:- Requirement, Network Threats cryptography, Firewalls, Access control Methods.

TEXT BOOKS:

1. Broadband Communication System by AKUJUOBI & SADIKU (PHI)
2. Broadband Communication by Balaji Kumar.

WIRELESS MOBILE COMMUNICATION PAPER-X-2

MARKS-80

UNIT-I

A brief introduction to Mobile Telephony, Technologies and Choices.

Cellular Concept – System Design: Fundamentals: Frequency reuse, Channel Assignment, Handoff Strategies, Interferences and System Capacity, Trunking and Grade of Service; Improving coverage

and capacity in Cellular Systems – Cell Splitting, Sectoring, Repeaters and Range Extension, Microcell & Picocell Zone Concept. Antennas for Base Station and hand held Cellular phone.

UNIT-II

Mobile Radio Propagation : Large –Scale path loss, Ground Reflection Model , Diffraction, Scattering. Outdoor propagation Model – Okumura Model; Indoor Propagation Model: Partition losses, Log distance Path loss Model.

Small Scale Fading and Multipath, Doppler Shift . Types of Small Scale Fading and their effect on received signal.

UNIT-III

Wireless Networking :

Various Generations of Wireless Networks, Fixed Network Transmission Hierarchy, Traffic Routing in Wireless Networks – Circuit Switching, Packet Switching. The X . 25 Protocol.

Global System for Mobile (GSM): features, architecture, channel types, Frame Structure in GSM. Signal processing in GSM , CDMA Architecture.

UNIT-IV

Wireless Application Protocol (WAP) : The Mobile Internet standard, WAP Gateway and Protocols, wireless mark up Languages (WML), Wireless Local Loop (WLL) : Introduction to WLL Architecture, wireless Local Loop Technologies.

Third Generation (3G) Mobile Services : Introduction to International Mobile Telecommunications 2000 (IMT 2000) Vision,

UNIT-V

General Packet Radio Services (GPRS) : GPRS Architecture, GPRS Network Nodes, Mobile Data Communication ; WLANs (Wireless LANs) IEEE 802.II standard, Mobile IP.

TEXT BOOKS:

1. Wireless Communication, 2nd Edition by Theodore S. Rappaport , Pearson Publication.
2. Mobile Communication Engg., 2nd Edition by William C. Y. Lee Mc Graw Hill International Edition.
3. Mobile Cellular Communications, 2nd Edition by William C. Y. Lee Mc Graw Hill International Edition.
4. Mobile Communication, 2nd Edition by Jocken Schiller, Pearson Education.
5. Wideband Wireless Digital Communication by Andreas F. Molisch Editor Pearson Education.

EMBEDED SYSTEM PAPER-X-3

MARKS-80

UNIT-I

Introduction : An embedded system, Processor in the system, other hardware units, software embedded into a systems, exemplary embedded system-on-chip (SOC) and VLSI circuit.

UNIT-II

Devices and Device Drivers : I/O devices, Timer and counting devices, serial communication using the IC, CAN and advance I/O buses between the networked multiple devices, Host system or computer parallel communication between the networked I/O multiple devices using the ISA, PCI, PCI-X and advance buses, Device drivers, Parallel port devices drivers in a system, Serial port device ,Drives in a system, Interrupt servicing (Handling) mechanism.

UNIT-III

Software and Programming Concept : Processor selection for an embedded system, memory selection for an embedded system, Embedded programming in C ++, Embedded programming in JAVA, Unified modeling language (UML), Multiple processes and application, problem of sharing data by multiple tasks and routines, Inter process communication.

UNIT-IV

Real time Operating System : Operating system services, I/O subsystem, Network operating system, Real Time and embedded system, Need of well tested and debugged Real time operating system (RTOS), Introduction to C/ OS- II.

UNIT-V

Case studies of programming with RTOS : Case study of an embedded system for a smart card Hardware and Software Co-design : Embedded system project management, Embedded system design and co-design issues in system development process, design cycle in the development phase for an embedded system, Use of software tools for development of an embedded system, Issues in embedded system design.

TEXT BOOKS:

1. Embedded System Architecture, Programming and Design, Raj Kamal, TMH
2. Hardware Software Codesign of Embedded System, Ralf Niemann, Kulwer Academic
3. Embedded Real time system Programming, Sriram V. Iyer and Pankaj Gupat, TMH

SOFT COMPUTING PAPER-X-4

MARKS-80

UNIT-I

Basic tools of soft computing-Fuzzy logic, Neural Networks and Evolutionary Computing, Approximations of Multivariate functions, Non-linear Error surface and optimization.

UNIT-II

Fuzzy Logic Systems: Basic of fuzzy logic theory, Crisp and fuzzy sets, Basic set operations. Fuzzy relations, Composition of Fuzzy relations, Fuzzy inference, Zadeh's compositional rule of inference, Defuzzification, Fuzzy logic control; Mamdani and Takagi and sugeno architectures, Applications to pattern reorganization.

UNIT-III

Neural Networks: Single layer networks, Perceptron, Activation functions, Adalinc: Its training and capabilities, Weights learning, Multilayer perceptions: Error back propagation, Generalized delta rule.

UNIT-IV

Radial basis function networks and least square training algorithm, Kohonen self-organizing map and learning vector quantization networks, Recurrent neural networks, Simulated annealing neural networks, Adaptive neuro-fuzzy information; system(ANFIS), Applications to control and pattern reorganization.

UNIT-V

Evolutionary Computing: Genetic algorithms: Basic concepts, encoding, fitness function, reproduction, Differences of GA and traditional optimizations methods. Basic genetic programming concepts Applications.

TEXT BOOKS:

V. Keeman, "Learning and Soft Computing", pearson Education India.

1. J.S.R. jang. C.T. SUN and E. Mizutani, "Neuro-fuzzy and soft computing".PHI Pvt. Ltd., New Delhi.
 2. Fredric M.Ham and Ivica Kostanic, "Principle of Neuro Computing for Science and Engineering", Tata McGrawHill.
 3. S. Haykins, "Neural networks : a comprehensive foundations". Pearson Education, India.
 4. Soft computing by Mitsuani & Jang (PHI)
 5. Fuzzy Logic by PAI & others (PHI)
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PROJECT (MAJOR PAPER-X-5

MARKS-100

Every student will have to do project report in any area of Electronics & Telecommunication detailed in the curriculum under the guidance of regular / guest faculty/ Industry experts. It should be research based to create new knowledge in any area of Electronics & Telecommunication. The student shall submit the project report before the Term – End examination. Marks will be awarded (out of 100) for the project report after viva internally.

Mark Distribution:

1.	Project Demo	-	30
2.	Project Report	-	20
3.	Presentation / Seminar	-	25
4.	Viva	-	25

SEMINAR PAPER-x-6

MARKS-50

COMP. VIVA-VOCE PAPER-x-7

MARKS-50
