UNIVERSITY OF KERALA
ELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF STUDIES AND EXAMINATION AND SYLLABUS FOR B. TECH DEGREE
III to VIII SEMESTERS 2003 SCHEME

Semester III

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.301	Engg.MathematicsII	3	1	0	50	3	100	4
03.302	Electrical Technology (TA)	2	1	0	50	3	100	3
03.303	Solid State Devices (TA)	3	1	0	50	3	100	4
03.304	Electronic Circuits I (TA)	3	1	0	50	3	100	4
03.305	Network Analysis (TA)	3	1	0	50	3	100	4
03.306	Programming In C++ (TA)	2	0	2	50	3	100	4
03.307	Electronic workshop (TA)	0	0	3	50	3	100	3
03.308	Electronic Devices Lab (TA)	0	0	3	50	3	100	3
	TOTAL	16	5	8	400		800	29

Semester IV

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.401	Engineering Mathematics III	3	1	0	50	3	100	4
03.402	Humanities (TA)	3	0	0	50	3	100	3
03.403	Analog Communication (TA)	2	1	0	50	3	100	3
03.404	Signals And Systems (TA)	3	1	0	50	3	100	4
03.405	Electronic Circuits II (TA)	3	1	0	50	3	100	4
03.406	Digital Electronics (TA)	2	1	0	50	3	100	3
03.407	Programming & Simulation Lab(TA)	0	0	4	50	3	100	4
03.408	Electronic Circuits Lab (TA)	0	0	4	50	3	100	4
	TOTAL	16	5	8	400		800	29

Semester V

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.501	Engineering Mathematics IV	3	1	0	50	3	100	4
03.502	Industrial Management (TA)	2	1	0	50	3	100	3
03.503	Linear Integrated circuits (TA)	2	1	0	50	3	100	3
03.504	Computer Organization (TA)	2	1	0	50	3	100	3
03.505	Applied Electromagnetic Theory (T)	3	1	0	50	3	100	4
03.506	Elective I (TA)	3	1	0	50	3	100	4
03.507	Digital Electronics Lab (TA)	0	0	4	50	3	100	4
03.508	Integrated Circuits Lab (TA)	0	0	4	50	3	100	4
	TOTAL	15	6	8	400		800	29

Semester VI

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.601	Digital Signal Processing (TA)	3	1	0	50	3	100	4
03.602	Microprocessors (TA)	3	1	0	50	3	100	4
03.603	Industrial Electronics &Instrumentation	2	1	0	50	3	100	3

	(T)							
03.604	Digital Communication (T)	2	1	0	50	3	100	3
03.605	Antenna & Wave Propagation (T)	2	1	0	50	3	100	3
03.606	Elective II (TA)	3	1	0	50	3	100	4
03.607	Communication Engg.Lab (T)	0	0	4	50	3	100	4
03.608	Mini Project (TA)	0	0	4	50	3	100	4
	TOTAL	15	6	8	400		800	29

Semester VII

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.701	VLSI Circuit Design (TA)	3	1	0	50	3	100	4
03.702	Information Theory & Coding (T)	3	1	0	50	3	100	4
03.703	Microwave Engg. (T)	2	1	0	50	3	100	3
03.704	Control Systems (T)	2	1	0	50	3	100	3
03.705	Elective-III (TA)	3	1	0	50	3	100	4
03.706	Elective IV (TA)	3	1	0	50	3	100	4
03.707	Micro Processor .Lab (TA)	0	0	2	50	3	100	2
03.708	Digital Signal Processing Lab (T)	0	0	2	50	3	100	2
03.709	Project Design & Seminar(TA)	0	0	3	75+25	-	-	3
	TOTAL	16	6	7	500		800	29

Semester VIII

Course No	Name of subject	Weekly load, hours			Max sessional marks	Exam Dur Hrs	Exam max marks	Credits
		L	T	D/P				
03.801	Optical Communication (T)	2	1	0	50	3	100	3
03.802	Radar & Television Engineering (T)	2	1	0	50	3	100	3
03.803	Computer Communication (T)	2	1	0	50	3	100	3
03.804	Satellite & Mobile Communication (T)	2	1	0	50	3	100	3
03.805	Elective V (TA)	3	1	0	50	3	100	4
03.806	Elective VI (TA)	3	1	0	50	3	100	4
03.807	Microwave & Optical Communication Lab (T)	0	0	4	50	3	100	4
03.808	Project & Viva- voce (TA)	0	0	5	150	3	100	5
	TOTAL	14	6	9	500		800	29

03. 506 Elective I

1. Network Synthesis (TA)
2. Data Structures in C++ (TA)
3. Probability & Random Processes (TA)
4. JAVA & Internet Programming (TA)
5. Digital Systems Design (TA)
6. Logic Synthesis (TA)
7. Electronic Product Design (TA)

03. 606 Elective II

1. Designing with VHDL (TA)
2. Linear Algebra for Electronics Engg. (TA)
3. Fuzzy Systems (TA)
4. Analog Circuit Design (TA)

5. Electronic Materials (TA) 6. Graph Theory (TA) 7. Artificial Intelligence & Expert Systems (TA)

03. 705 Elective III	03.706 Elective IV
1. Image Processing (TA) 2. Speech Processing (TA) 3. Pattern Recognition (TA) 4. Quantum Computing (TA) 5. Antenna Theory & Design (TA)	1. Advanced Microprocessor Architecture & Programming (TA) 2. Optoelectronic Devices (TA) 3. System Software (TA) 4. Discrete Event System Simulation (TA) 5. Microwave Solid State Devices & Circuits (TA)

03. 805 Elective V	03. 806 Elective VI
1. Multirate Systems & Wavelets (TA) 2. Integrated Optics & Photonic Systems (TA) 3. Software Architecture & Systems (TA) 4. Artificial Neural Networks (TA) 5. CDMA Systems (TA)	1. Adaptive Signal Processing (TA) 2. Embedded Systems (TA) 3. Microcontroller Based System Design (TA) 4. Communication Protocols (TA) 5. Biomedical Engineering (TA)

03.301 Engineering Mathematics- II 3-1-0 4 Credits

(Common to all branches)

MODULE 1: Ordinary Differential Equations

Differential equations of the first order and higher degree: Equations solvable for p-Equations solvable for x-Equations solvable for y-Clairut's Equation.

Linear Differential Equations: Higher order with constant coefficients-Method of variation of parameters-Homogeneous linear equations (Cauchy's and Legender's)-
Simultaneous linear equations with constant coefficients.

Orthogonal Trajectories: Cartesian form only.

MODULE 2: Fourier Series And Multiple Integrals

Fourier Series: Dirichlet's conditions-Euler's Formula-Functions with periods 2π and $2l$-Even and odd functions-Half range sine and cosine series.

Multiple Integrals: Evaluation-Change of order of integration-Transformation to polar coordinates-Area as double integral-Volume as triple integral (cartesian coordinates only).

MODULE 3: Vector Calculus

Vector differentiation: Derivative of a vector function-Velocity and acceleration-Scalar and vector fields-Gradient-It's geometrical interpretation-Directional derivative-Divergence and Curl-Their physical meaning-Relations involving ∇ -Solenoidal and irrotational fields-Scalar potentials(simple problems).

Vector Integration: Line integral, surface integral and volume integral-work done by a force-Statement and verification of Green's theorem, Stoke's theorem and Gauss' Divergence theorem-their use in evaluating the integrals.

References:

1. Engineering Mathematics, Vol 2: S.S Sastry, Prentice Hall of India (P) Ltd.
2. Higher Engineering Mathematics: B. S. Grewal, Khanna Publishers
3. Engineering Mathematics: Sarveswara Rao Koneru, Universities Press
4. Advanced Engineering Mathematics: Michael D. Greenberg, Pearson Education

Note: The question paper consists of two parts. Part A (40 marks). Ten compulsory questions of 4 marks each. Part B (60 marks). Students must answer one out of two questions from each module. Each question carries 20 marks

03.302 ELECTRICAL TECHNOLOGY (TA) 2-1-0

Module I

Transformers - Constructional details - principles of operation emf equation-phasor diagram on load - Equivalent circuit - regulation - losses and efficiency. Methods of cooling. OC and SC test determination of equivalent circuit. Autotransformers. Instrument transformers.

DC Generators - Constructional details - principle of operation - emf equation - types of generators - performance characteristics and applications. DC Motors - production of torque - shunt, series and compound motors - performance characteristics - applications - methods of seed control - starters. Universal motor, DC servomotors - principle of operation, characteristics and application.

Module II

Three phase induction motor - constructional details - slip ring and cage type - production of torque - slip - performance characteristics and application. Starters - star delta and rotor resistance types. Methods of speed control - stator voltage, V/f control. Losses and efficiency. No load and blocked rotor tests - determination of equivalent circuit.

Single phase induction motor - types - characteristics and applications.

Stepper motor - principle of operation and applications.

Alternator - constructional details - frequency - emf equation - phasor diagram on load - concept of regulation.

Synchronous motor - principle of operation - methods of starting - applications.

Module III

Measurements of power and energy in single and three phase system.

Electric heating - Resistance furnaces and ovens - methods of temperature control. Electric arc furnaces and induction furnace. High frequency heating - induction and dielectric heating - applications.

Electric welding - resistance and arc welding - power supply and current control.

Electric traction - systems of power supply - functional schematic of AC electric locomotives - types of motors used in traction systems and methods of speed control - methods of braking.

Text books :

1. B.L.Theraja, A.K.Theraja - *A text book of Electrical Technology, Vol. 2*, S.Chand & Co.
2. Partab - *Art and Science of Utilisation of Electric Energy*: Dhanpath Rai & Sons.

References :

1. Metha V.K.- *Principles of Electrical Engineering and Electronics*, S.Chand & Co.
2. Gupta J.B.- *A Course in Electrical Power* - S.K.Kataria & Sons, New Delhi.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.303 SOLID STATE DEVICES (TA) 3-1-0

Module I

Introduction to Quantum mechanics. Fermi-dirac distribution. Energy bands in Solids - Bonding of atoms in solids, formation of Energy bands in solids, metals, insulators and semiconductors, energy momentum relation for electrons in solids, effective mass. Semiconductor materials and properties - Classification, elemental and compound semiconductors - intrinsic semiconductors, extrinsic semiconductors, doping of compound semiconductor. Energy band model of intrinsic and extrinsic semiconductors. Equilibrium concentration of electrons and holes, the density of states function (no derivation), effective density of states. Temperature dependence of intrinsic carrier concentration. Ionisation of impurities. The Fermi level and energy distribution of carriers inside the bands. Constancy of Fermi level at equilibrium. Temperature dependence of carrier concentration in an extrinsic semiconductor. Carrier transport in semiconductors – Drift, Relaxation time and mobility. Carrier scattering mechanisms, variation of mobility with temperature and doping, conductivity. Hall effect.

Module II

Excess carriers in semiconductors - Injection of excess carriers, mechanisms of recombination, origin of recombination centres, excess carriers and quasi Fermi levels, diffusion, Einstein relations. Continuity equations. PN junctions - the abrupt junction, electric field and potential distribution, built in voltage, depletion layer capacitance, the linearly graded junction - electric field, built in potential, junction capacitance. Static IV characteristics - ideal diode model, simplifying assumptions, the ideal diode equation, long base diodes, majority and minority carrier currents. Real diodes - IV characteristics. Temperature dependence of IV characteristics. High level injection

effects. Electrical breakdown in PN junctions - Zener break down, avalanche break down (abrupt PN junctions only), Schottky diode.

Module III

Bipolar junction transistor - transistor action, current components, basic parameters. Analysis of the ideal transistor - calculation of terminal currents (based on physical dimensions), calculation of dc parameters. effect of collector bias variation, Avalanche multiplication in collector-base junction, Base resistance, Static IV characteristics of Common Base and Common Emitter configurations. Regions of operation.

Field Effect Transistors: JFET - principle of operation, current equation, static IV characteristics, device parameters. MOS Transistors - Ideal MOS capacitor, effect of real surfaces, threshold voltage, Capacitance -Voltage characteristics of the MOS capacitor, Basic structure and principle of operation of MOSFETs, IV characteristics. Basic principle & characteristics of UJT and SCR (no analysis).

Text Book:

Ben G. Streetman : *Solid State Electronic Devices*, 5th Edn., Pearson Education, 2000/ PHI.

References:

1. M.S.Tyagi : *Introduction to Semiconductor Materials and Devices*, John Wiley &Sons.
2. Warner and Grung : *Semiconductor Device Electronics*, Holt Rinhalt & Winston 1991.
3. S.M.Sze : *Physics of Semiconductor Devices*, Wiley Eastern.
4. FFY Wang : *Introduction to Solid State Electronics*, North Holland, 1980.
5. E.H. Nicollian and J.R. Brews : *MOS Physics & Technology*, John Wiley.
6. Y.P.Tsividis : *Operation and Modelling of the MOS Transistor*, Mc Graw Hill, 1986.
7. Deepankar Nagchaudhari : *Microelectronic Devices*, Pearson Education, 2002
8. Baker/Li : *CMOS* - PHI

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.304 ELECTRONIC CIRCUITS - I (TA) 3-1-0

Module I

RC Circuits: Response of high pass and low pass RC circuits to sine wave, step, pulse and square wave inputs, Tilt, Rise time. Differentiator, Integrator, clipping and clamping circuits. Analysis of Half wave, full wave and bridge rectifiers. Analysis of L, C, LC & Filters. Zener voltage regulator, transistor series (with feedback) and shunt voltage regulators, Short circuit protection.

Module II

Biasing : Transistor Biasing circuits, Stability factors, Thermal runaway. DC analysis of BJTs - graphical analysis, small signal equivalent circuits (Low frequency and T models only).

Analysis of CE, CB, CC configurations (gain, input and output impedance), Cascading of BJT amplifiers.

Biasing of JFETs, Small signal model, analysis of CS, CG, and CD amplifiers. Biasing of MOSFETs, current mirror circuit, Widlar circuits. Small signal equivalent circuits. Analysis of MOSFET amplifiers (CS only).

Module III

Power amplifiers: Class A, B, AB circuits - efficiency and distortion. Biasing of class AB circuits. Transformerless power amplifiers.

Low frequency Oscillators : Barkhausen criterion, RC phase shift and Wien bridge oscillators - analysis.

Transistor switching circuits : Transistor switching times. (Delay, rise, storage and fall time). Analysis of collector coupled Astable, Monostable and Bistable multivibrators, Schmitt trigger – analysis.

Text books

1. Sedra and Smith : *Microelectronic Circuits*, IV Ed., Oxford University Press 1998.
2. Millmann and Taub : *Pulse Digital and Switching Waveforms*, TMH.

References:

1. Millmann and Halkias : *Integrated Electronics*, TMH.
2. Gopakumar : *Design and Analysis of Electronic Circuits*, Phasor books.
3. R E Boylstad and L Nashelsky : *Electronic Devices and Circuit Theory*, PHI, 2002.
4. Neamen, Donald : *Electronic Circuit Analysis and Design*, TMH.
5. Spencer & Ghausi : *Introduction to ElectronicCircuit Design*, Pearson Education 2003.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.305 NETWORK ANALYSIS (TA) 3-1-0

Module I

Elements of Network Analysis-Network theorems, Thevenin's theorem, Norton's theorem, Superposition theorem, Reciprocity theorem, Millman theorem-Maximum Power Transfer theorem. Insertion loss.

Signal representation - Impulse, step, pulse and ramp function. Use of Laplace Transform in the transient analysis of RC and LC networks with impulse, step, exponential, pulse and sinusoidal inputs. Initial and final value theorems, step input for RLC circuits.

Module II

Network functions - The concept of complex frequency - driving point and transfer functions - Impulse response - Poles and Zeros of network functions and their locations and effects on the time and frequency domain. Restriction of poles and zeros in the driving point and transfer function. Time domain behaviour from the pole - zero plot. Frequency response plots - Magnitude and phase plots from s-plane phasors, Bode plots. Parameters of two-port network – impedance, admittance, transmission and hybrid - Conversion formulae. Attenuators – propagation constant, types of attenuators – T, and Bridged T.

Module III

Resonance in series and parallel circuits- resonant frequency- bandwidth - Q factor, Selectivity. Coupled circuits, single tuned and double tuned circuits, coefficient of coupling, Image Impedance, Characteristic impedance and propagation constant.

Filter approximations - Butterworth response - poles of the Butterworth function, Chebyshev response - Chebyshev polynomials - equi ripple characteristics - poles of the Chebyshev function, inverse Chebyshev response, Bessel-Thomson response. Frequency transformations - transformations to high pass, band pass and band elimination.

Text Books:

1. Roy Choudhary :*Networks and Systems,* New Age International.
2. Wai Kai Chen :*Passive and Active Filters-- Theory and Implimentations* , John Wiley & Sons.

References:

1. M E. Van Valkenburg :*Analog Filter Design* , Saunder's College Publishing.
2. V .K .Aatre: *Network Theory and Filter Design,* Wiley Eastern.
3. Sudhakar and S .P. Shyam Mohan :*Circuits and Network Analysis,* TMH.
4. Van Valkenburg :*Network Analysis* , PHI.
5. C L Wadhwa : *Network Analysis and Synthesis* ,New Age International.
6. Hayt, Kemmerly :*Engineering Circuit Analysis* ,TMH ,6/e

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.306 PROGRAMMING IN C++ (TA) 2-0-2

Module I

Types and declarations: Types - boolean, character, integer, floating point, void, enumerated. Conditional statements and loops. Declarations- structure, multiple names, scopes, initialization, Function declaration, argument passing, value return. Classes - objects, private, public and protected variables. Pointers, arrays, pointer to arrays, constants, reference, pointer to void ,new operator, delete operator.

Module II

Function overloading, operator overloading, friend function, derived class (inheritance), polymorphism , virtual function, templates, files and streams. Programming tools, make files, debuggers, revision control systems, exception handling.

Module III

Data structures: Linked (single and double) lists -basic operations, stack -basic operations, binary trees- basic operations. Sorting - bubble sort, shell sort, merge sort, quick sort.

Text Books:

1. B Stroustrup: *C++ Programming Language,* AW , 3rd Edition.
2. AV Aho and JD Ullman: *Data Structures and Algorithms,* AW .

References:

1. Bruce Eckel: *Thinking in C++* , Volume 1 & Volume 2, Pearson Education.
2. Robert Kruse et al: *Data Structures and Program Design in C* , PHI, 2nd Ed.
3. Balaguruswami : *Programming in C ++* , Shaum's Series.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.307 ELECTRONICS WORKSHOP (TA) 0-0-3

1. Identification of components and devices.
2. Testing of components and devices.
3. Design and construction of small transformers.
4. Use of measuring instruments like RLC meter, Power meter, Frequency meter, CRO for the measurements of phase, rise time & fall time etc.
5. Preliminary idea of PCB fabrication .
6. Soldering practice –Soldering of given circuits (Rectifiers, amplifiers, oscillators, multivibrators,
7. Differentiating & Integrating circuits, RC filter circuits, clipping & clamping circuits.)

For University examination, the following guidelines should be followed regarding award of marks

(a) Layout -25%
(b) Soldering -25%
(c) Result -25%
(d) Viva voce -25%

Practical examinations are to be conducted covering the entire syllabus given above.

03.308 ELECTRONIC DEVICES LAB (TA) 0-0-3

1. Characteristics of Diodes & Zener diodes
2. Characteristics of Transistors (CE & CB)
3. Characteristics of FETs & UJTs
4. Characteristics of SCRs & Triac.
5. Frequency response of RC Low pass and high pass filters. Response to Square wave for Integrating and Differentiating circuits.
6. Zener Regulator with & without emitter follower.
7. RC Coupled (CE) amplifier using transistors -frequency response characteristics.
8. FET amplifier (CS) - frequency response characteristics.
9. Clipping and clamping circuits.
10. Rectifiers-halfwave, fullwave, Bridge with and without filter- ripple factor and regulation.

Note:

For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design -25%
(b) Result & Performance -50%
(c) Viva voce -25%

Practical examinations are to be conducted covering the entire syllabus given above.

03. 401 Engineering Mathematics – III 3-1-0 4 credits
(Common to all branches)

MODULE I

Partial Differential Equations

Formation of P D E -Solution by direct integration -solution of Lagrange's linear equations-Non linear equations of first order-Types $f(p,q)=0$, $f(z,p,q)=0$, $f(x,p)=g(y,q)$-

Homogeneous P.D.E with constant coefficients-solution by the method of separation of variables.

MODULE 2

Application of partial differential Equations

Derivation of one dimensional wave equation-solution of the wave equation by the method of separation of variables –Boundary value problems involving wave equation-Derivation of one dimensional heat equation-solution by the method of separation of variables-Problems with zero and nonzero boundary conditions-Solution of Laplace equation in two dimensions(cartesian only)-Problems on finite and infinite strips.

MODULE 3

Fourier Transforms and Optimization Techniques

Fourier Transforms: Fourier integral Theorem (no proof)-Fourier sine and cosine integrals-Fourier Transforms-complex form-Sine and cosine Transforms-Inversion Formula-simple problems.

Optimization techniques: Linear Programming Problems-Formulation-Graphical solution-General L.P.P-Slack and Surplus variables-Basic feasible solution-Solution of L.P.P. using Simplex method-Big-M-method-Duality-Dual Simplex method.

References:

1. Engineering Mathematics, Vol.3 :V. Sunderam, R. Balasubramanian, K. A. Lakshminara-yanan, Vikas Publishing House (P) Ltd.
2. Higher Engineering Mathematics: B. S. Grewal, Khanna Publishers.
3. Advanced Engineering Mathematics: Michael D. Greenberg, Pearson Education.
4. Engineering Mathematics, Vol.2 :S. S. Sastry, Prentice Hall Of India (P) Ltd.
5. Engineering Mathematics: Sarveswara Rao Koneru, Universiries Press.
6. Quantative Techniques: P.C. Tulsian and Vishal Pandey, Pearson Education.

Note:

The question paper consists of two parts. Part A (40 marks). Ten compulsory questions of 4 marks each. Part B (60 marks). Students must answer one out of two questions from each module. Each question carries 20 marks

03.402 Humanities 3-0-0 3 Credits

Part I – Economics (2 Periods per week)

Module I

1. Definition and scope of Economics-Definition of basic terms-Goods-wants and their classifications-wealth- Income –Money- -Near money-Credit money-Utility, features and kinds of utility – National Income and related concepts as GNP, NNP, -Disposable Income Resource Allocation, Technological choice & production possibility curve. Indifference curve analysis- the concept of supply- Supply curves-Cost curves – loss of returns.
2. Basic laws in Economics – Law of Diminishing marginal utility – Demand, Law of Demand and demand curve- The concept of supply- Supply schedule and supply curve.

Module II

3. Market structure – Classifications – Pricing under different markets as perfect competition, monopoly and oligopoly. Pricing under monopolistic competition.
4. Inflation –Measures to control inflation –Monetary measures and fiscal measures – Effects of inflation.
5. Tax – Classification of Taxes – Direct & Indirect taxes specific and Ad Valorem taxes – personal income tax – characteristics of a good tax system – Tax evasion.

Module III

6. International Monetary Fund – Issues & Challenges – International liquidity – Special Drawing Rights - India & M.F.
7. Welfare Economics – Old Welfare Economics -Pigou's Analysis – New Welfare Economics Pareto's welfare criterion

Books for Study : Part-I

Dewtt K.K Modern Economic theory

Books for References:-

1. Prof. G Narendrababu " Elements of Ecomic Analysis"
2. Sundaran K.P.M "Money, Banking .Trade & Finance "

Part II – Communicative English (1 period per week)

Reading - Skimming -scanning -detailed reading -predicting content -interpreting charts and tables -identifying stylistic features in texts - evaluating texts -understanding discourse coherence -guessing meaning from the context -note making / transferring information.
Word formation with prefixes and suffixes -discourse markers and their functions -degrees of comparison - expressions relating to recommendations and comparisons -active and passive voice -antonyms -tense forms - gerunds - conditional sentences -modal verbs of probability and improbability -acronyms and abbreviations - compound nouns and adjectives -spelling -punctuation.
Sentence definition -static description -comparison and contrast -classification of information -recommendations - highlighting problems and providing solutions -formal and informal letter writing -using flow -charts/diagrams paragraph writing -editing.
Defining, describing objects -describing uses/functions -comparing -offering suggestions -analysing problems and providing solutions -expressing opinions (agreement/disagreement) –expressing possibility/certainty – framing questions -providing answers.

Text Books: Part II

1. "English for Engineers and Technologists", Volume I. Authors :Humanities and Social Science Department, Anna University, Published by Orient Longman Ltd., 1990.
2. Sarah Freeman, Written communication in English, Orient Longman, 1977.

References:

1. Narayanaswami, V R, Strengthen Your Writing, Orient Longman Ltd., Chennai 1996 (Revised Edition)
2. Pickett and Laster, Technical English, Writing, Reading and Speaking, New York Harper and Row Publications.
3. Swan, Michael, Basic English Usage, Oxford University Press, 1984.
4. Bhatnagar and Bell, Communication in English, Orient Longman, 1979.
5. Pravin S R Bhatia, A M .Sheikh, Professional Communication skills, S.Chand and Company Ltd., 2003.

University Question

Note: Part I and Part II to be answered in separate answer books.
Part – I Humanities. Part A – 30 Marks (short answers) Covering entire syllabus (3x10=30)
Part B – 40 Marks (50% choice – One out of two or two out of four from each module.)
Part - II Communicative English. 30 marks (50% choice)

03.403 ANALOG COMMUNICATION (TA) 2-1-0

Module I

Telephone systems –electronic telephone -digital switching –trunk circuits –private telephone networks.
Amplitude modulation - Frequency spectrum, power relation, DSB-SC modulation, modulation and demodulation circuits, AM transmitters. Receivers - Superheterodyne receivers, tracking, sensitivity and gain, image rejection and AGC, double conversion receivers, single conversion receivers, Single side band modulation – principle, balanced modulation, SSB generation and reception, companded SSB.

Module II

Angle modulation - FM spectrum, modulation index, phase modulation, comparison of various modulation schemes, angle modulation and demodulation circuits, AFC, amplitude limiters, pre-emphasis and de-emphasis, FM broadcast transmitters and receivers.
Noise in analog modulation systems - Noise in linear receivers using coherent detection, noise in AM receivers using envelope detection, noise in FM receivers.

Module III (Quantitative Approach)

Probability Concepts, Random Variables, Statistical averages.
Random Processes - Introduction, definition, stationary processes, mean, correlation and covariance functions - properties of Auto correlation & cross correlation functions. Ergodic processes, transmission of Random Processes, power spectral density and its properties, cross spectral densities. Guassian process - central limit theorem, properties.
Noise – Shot noise, thermal noise and white noise, S/N ratio, noise figure, narrow band noise, representation in terms of in-phase and quadrature components, envelope and phase components, sine wave plus narrow band noise.

Text Books:

1. Dennis Roody & John Coolen: *Electronic Communication*, PHI, 4th edn.
2. Simon Haykin: *Communication Systems*, 4th edn, John Wiley & Sons.

References:

1. Proakis and Salehi: *Communication System Engineering*, 2nd edn., Pearson Education.

2. George Kennedy: *Communication Systems* , 3 ed., Tata McGraw Hill.
3. B P Lathi: *Modern Digital and Analog Communication Systems* , 3 edn., Oxford University Press.
4. Leon W Couch II : *Digital and Analog Communication Systems* , 6th edn, Pearson Education.

Question Paper

The Question paper will consist of two parts. Part1 is to cover entire syllabus, and compulsory for 40 marks. This may contain 20 questions of 2 marks each.

Part II is to cover 3 modules. There can be 3 questions from each module (10 marks each) out of which 2 are to be answered, or there will be two questions from each module (20 marks each) out of which one is to be answered.

03.404 SIGNALS & SYSTEMS (TA) 3-1-0

Module I (Quantitative Approach)

Introduction – continuous time & discrete time signals, Basic operations on signals-operations on dependent and independent variables, elementary signals- exponential, sinusoidal, step, impulse and ramp functions, Continuous time & Discrete time systems – system properties— memory, invertibility, linearity, time invariance, causality, stability, Impulse response & step response of systems, convolution.

Fourier series representation of continuous time and discrete time periodic signals.

Module II (Quantitative Approach)

Continuous Time Fourier Transform – properties – systems characterized by differential equations. Discrete Time Fourier Transform – properties – systems characterized by difference equations . Sampling theorem – Reconstruction – Aliasing.

Module III (Quantitative Approach)

The Laplace Transform – ROC – Inverse transform – properties – Analysis of LTI systems using Laplace Transform – unilateral Laplace Transform.

The Z transform – ROC – Inverse transform – properties – Analysis of LTI systems using Z transforms – unilateral Z transform.

Text Book :

Alen V Oppenheim , Alen SW illsky : *Signals & Systems* , 2nd edn., Pearson Education.

References:

1. Rodger E. Ziemer: *Signals & Systems - Continuous and Discrete* 4th Edn., Pearson Education.
2. Asok Ambardar : *Analog and Digital Signal Processing* , Thomson Learning.
3. B P. Lathi: *Linear Systems and Signal Processing* , Oxford Publication.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.405 ELECTRONIC CIRCUITS - II (TA) 3-1-0

Module I

High frequency equivalent circuits of BJTs, MOSFETs, Miller effect, short circuit current gain, s-domain analysis, amplifier transfer function. Low frequency and high frequency response of CE , CB , CC and CS , CG , CD amplifiers. Frequency response of cascade, cascode and Differential (emitter coupled) amplifiers.

Module II

Differential Amplifiers - BJT differential pair, large signal and small signal analysis of differential amplifiers, Input resistance, voltage gain, CMRR , non ideal characteristics of differential amplifier. Current sources, mirrors, Active load. MOS differential amplifiers, multistage differential amplifiers.

Analysis of BJT tuned amplifiers, synchronous and stagger tuning. Analysis of High frequency oscillators- Hartley, Colpitts, Clapp and crystal oscillators.

Module III

Feed back amplifiers (discrete only) - Properties of negative feed back. The four basic feed back topologies-Series-shunt, series-series, shunt-shunt, shunt-series, loop gain, Bode plot of multistage Amplifier, Stability, effect of feedback on amplifier poles, frequency compensation-Dominant and Pole-zero.

Sweep circuits-Miller and Bootstrap.

Text books

1. Sedra and Smith :*Microelectronic Circuits* , IV Ed.,Oxford University Press 1998.
2. Millman and Taub:*Pulse Digital and Switching Waveforms,* TataMcGraw Hill.

References:

1. Millmann and Halkias: *Integrated Electronics* , TataMcGraw Hill.
2. R E Boylstad and L Nashelsky: *Electronic Devices and Circuit Theory* ,Prentice Hall of India 2002.
3. Gopakumar: *Design and Analysis of Electronic Circuits,* Phasor books.
4. Neamen, Donald: *Electronic Circuit Analysis and Design,* TataMcGraw Hill.
5. Spencer& Ghausi :*Introduction to ElectronicCircuit Design,* Pearson Education 2003.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.406 DIGITAL ELECTRONICS (TA) 2-1-0

Module I

Review of Boolean algebra- rules, laws and theorems – sum of product and product of sum simplification, Karnaugh map (upto 4 variables), completely and incompletely specified functions, Quine McCluskey method (upto 5 variables). Combinational logic circuits- adders, subtractors, ripple carry and look ahead carry adders, comparators, decoders, encoders, multiplexers, demultiplexers. Introduction to VHDL. Logic gates, decoders, encoders in VHDL, adders in VHDL. Memories – ROM - organisation, expansion. PROMs, RAMs – Basic structure, 2-dimensional organization, Static and dynamic RAMs

Module II

Integrated Circuit technologies – Characteristics and Parameters. TTL Circuits – NOT, NAND, NOR, Open collector, tristate gates, positive and negative logic, ECL OR-NOR, IIL, CMOS-NOR, NOT, NAND, comparison. Differences between combinational and sequential circuits – flip flops – SR, JK, D, T, Master slave, characteristic equations, conversion of one type of flip flop into another, Shift register, Universal shift register, applications. Binary counters – Synchronous and Asynchronous- design, Counters for random sequence- design. Multivibrators – astable and monostable multivibrators using gates, 74121 and 74123.

Module III

Analysis of synchronous sequential circuits - Synchronous sequential machine – The moore machine, mealy machine, timing diagram. Design of synchronous sequential circuits – examples, State diagram, State table, State transition and output tables, logic diagram, Analysis of synchronous sequential circuits – examples. Asynchronous sequential circuit – basic structure, equivalence and minimization, minimization of completely specified machines, State simplification of redundant states, Incompletely specified machines. Hazards – causes of hazards, Logic hazards, essential hazards, function hazards, design of hazard free combinational networks.

Text Books:

1. C H. Roth, Jr. :*Fundamentals of Logic Design* , 5th Edn., Thomson Learning.
2. B. Somanathan Nair :*Digital Electronics and Logic Design* , PHI, 2002.

References:

1. Anand Kumar A.: *Fundamentals of Digital Circuits* ,PHI.
2. Yarbrough, John M :*Digital logic- Application and Design,* Vikas Thomson Learning, New Delhi.
3. John F Wakerly : *Digital Design Principles and Practice,* Pearson Education.
4. C.H. Thomas L Floyd: *Digital Fundamentals,* Pearson Education, 8th Edn
5. M. Moris Mano :*Digital Design* , Pearson Education, 3rd Edn.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.407 PROGRAMMING & SIMULATION LAB (TA) 0-0-4

Introduction to SPICE

Models of resistor, capacitor, inductor, energy sources (VCVS, CCVS, Sinusoidal source, pulse, etc), transformer. Models of DIODE, BJT, FET, MOSFET, etc. sub circuits.

Simulation of following circuits using spice (Schematic entry of circuits using standard packages. Analysis- transient, AC, DC, etc.):

1. Potential divider.
2. Integrator & Differentiator (I/P PULSE) – Frequency response of RC circuits.
3. Diode Characteristics.
4. BJT Characteristics.
5. FET Characteristics.
6. MOS characteristics.
7. Full wave rectifiers (Transient analysis) including filter circuits.
8. Voltage Regulators.
9. Sweep Circuits.
10. RC Coupled amplifiers - Transient analysis and Frequency response.
11. FET & MOSFET amplifiers.
12. Multivibrators.
13. Oscillators (RF & AF).

MATLAB:

Introduction to Matlab, study of matlab functions. Writing simple programs using matlab, for handling arrays, files, plotting of functions etc.

Writing M files for

Creation of analog & discrete signals, plotting of signals etc.

Filtering of analog & digital signals using convolution

Generation of noise signals (Gaussian, random, Poisson etc)

Simulation using Simulink.

Simulation study

(A) Design of analog low pass, bandpass, high pass and band elimination filters using Butterworth, Chebyshev etc.

(B) Anti-aliasing filters

(C) Bode plot

(D) Steady state and Transient analysis

(E) Z Transforms

(F) Fourier Analysis

Note:

For University examination, the following guidelines should be followed regarding award of marks:

(a) Programming and design -40%

(b) Result & Performance -35%

(c) Viva voce -25%

Practical examination to be conducted covering entire syllabus given above.

03.408 ELECTRONIC CIRCUITS LAB 0-0-4

1. Feed back amplifiers (current series, voltage series). Gain and frequency response
2. Power amplifiers (transformer less), Class B and Class AB. Measurement of Power.
3. Differential amplifiers. Measurement of CMRR
4. Cascade and cascode amplifiers. Frequency response.
5. Phase shift, Wein bridge, Hartley and Colpitts Oscillators, UJT Oscillators
6. A stable, Monostable and Bistable multivibrator circuits
7. Schmitt trigger circuits.
8. Tuned amplifiers, frequency response.
9. Series voltage regulator circuits.
10. Bootstrap sweep circuit.

Note

For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design -25%

(b) Result & Performance -50%

(c) Viva voce -25%

Practical examination to be conducted covering entire syllabus given above

03.501 Engineering Mathematics – IV 3-1-0 4 Credits
(Common to all branches)

MODULE 1: Complex Analysis-Differentiation

Differentiation of functions of complex variable-Analytic functions-Cauchy-Riemann Equations(cartesian only)-Harmonic function-Orthogonal system -velocity potential

Conformal mapping- Mapping by $w=1/z, w=z^2, w=e^z, w=z+1/z, w=\sin z, w=\cos z$.

Bilenear Transformation-fixed points-Problems to find the transformation when three points and their images are given.

MODULE 2: Complex Analysis-Integration

Line integrals-simple problems-Statements of Cauchy's integral theorem,Cauchy's integral formula-Formula for higher derivatives-Evaluation of integrals using the above results.

Taylor series and Laurent's series(no proof)-simple problems.

Singularities-Residues-Cauchy's Residue theorem (no proof)-problems.

Evaluation of real definite integrals of the following types:

$\int_0^{2\pi} f(\sin\theta, \cos\theta)\,d\theta$, $\int_0^{\infty} [f(x)/F(x)]dx$, $\int_0^{\infty} [\sin mx/f(x)]dx$, $\int_0^{\infty} [\cos mx/f(x)]dx$

MODULE 3: Probability and statistics

Random variable -continuous and discrete distribution-mean and variance-

Binomial distribution -mean and variance-fitting a Binomial distribution-Problems.

Poisson distribution- Poisson distribution as a limiting case of the Binomial distribution-mean and variance-Problems.

Normal distribution- Properties-Problems

Curve fitting- Fitting of a straight line and a second degree parabola,by the method of least squares.

Testing of Hypothesis- Types of errors-Null hypothesis-level of significance-Confidence limits-Large sample tests-testing of proportion of attributes-confidence limits for unknown mean-test of significance for means of two large samples-Use of Student's t distribution for small sample tests-Significance test of a sample mean-Significance test of difference between sample means.

References:

1 Higher Engineering Mathematics:B.S.Grewal,Khanna Publishers
2.Engineering Mathematics,Vol 2:S.S.Sastry,Prentice Hall of India(P)Ltd.
3.Complex Variables Theory And Applications:H.S.Kasana,Prentice Hall of India(P)Ltd
4 Advanced Engineering Mathematics:Michael D Greenberg,Pearson Education
5.Probability and Statistics for engineers,Miller& Freund,Pearson Education

Note:

The question paper consists of two parts. Part A (40 marks). Ten compulsory questions of 4 marks each. Part B (60 marks).Students must answer one out of two questions from each module.Each question carries 20 marks.

03.502 INDUSTRIAL MANAGEMENT (TA) 2 –1-0

Module I

Evolution of Scientific Management and Industrial Engineering. Functions of Management - Brief description of each function. System concept.

Types of Organisation structures such as line, staff, functional, project and matrix organisations.

Types of companies and their formation.

Personal Management - Objectives and functions - Recruitment, Selection, Training and Induction concepts and Techniques.

Accounting and financial Management - Principles of double entry-Preparation of Financial statements

Budget and budgetary control-Profit-Volume analysis.

Module II

Facilities Planning - Factors to be considered in site selection, layout planning, plant layout, Systematic layout planning, computerized layout planning techniques.

Introduction to Material Handling Principles.

Work study-Methods study and Time Measurement, Steps in methods improvement-Use of chart and diagrams.

Performance rating and Methods - Types of Allowances, computation of basic time and Standard time - Examples. Wages and Incentives-System of Wage Incentive Plans, Job evaluation and Merit rating.

Module III

Industrial relations- Fatigue and methods of eliminating fatigue.
Industrial disputes-Settlement Machinery-collective bargaining-Trade unions-Workers participation in Industries in Indian context.
Labour welfare and social security-Industrial safety-Methods and Techniques.
Production Planning and Control-Functions and Objectives-job, batch, mass and continuous production-Economic lot size, Routing, Scheduling, Dispatching and Follow up. Materials Management – Importance, Inventory, Types of systems, selective inventory control techniques.
Quality Engineering-Quality control-Quality Vs. Cost concept, Control chart for variables and attributes-Introduction to ISO-9000 series(2000 version), ISO 14000 (2000 version) and Total Quality Management, Quality Information systems, Benchmarking and Documentation.
Introduction to Marketing and its Environment - Marketing concept, Marketing mix.

References:

1. M.A. Sahaf: *Management Accounting Principles & Practices,* Vikas Publications Pvt. Ltd.
2. Grant and Levenworth: *Statistical Quality Control* , TMH
3. Krafewski: *Operations Management,* Pearson Education 6th Edn.
4. Introduction to Work Study – ILO
5. Besterfield: *Total Quality Management,* Pearson Education.
6. Richard L Francis & John A White: *Facility Layout & Location,* Prentice Hall
7. Kotler: *Marketing Management,* Pearson Education.
8. Roger G Schroedu: *Operations Management,* Mc Graw Hill.
9. Monappa: *Industrial Relations,* TMH
10. Stephen P Robbins, David A Decenyo: *Fundamentals of Management,* Pearson Education.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.503 LINEAR INTEGRATED CIRCUITS (TA) 2-1-0

Module I

Operational Amplifiers, ideal op-amp parameters, inverting and non-inverting amplifier, summing amplifier, integrator, differentiator, Differential amplifiers, Instrumentation amplifiers, V to I and I to V converters, Comparators, precision rectifiers, log-antilog amplifiers, oscillators -Phase-shift Wein-Bridge, multivibrators-Astable, Monostable, Schmitt Trigger, Square and triangular waveform generator. Non ideal op-amp. Effect of finite open loop gain, bandwidth and slew rate on circuit performance.

Module II

Simplified internal circuit of 741 op-amp. DC & AC analysis, Gain and frequency response.
Filters: Butterworth Ist order Low pass, high pass, bandpass and band elimination. Biquadratic filter (single op-amp with finite gain non inverting-Sallen and key) of Low pass, High pass, Band pass and Band elimination filters. Tow-Thomas filters. Filters using Antonios gyrator. Switched capacitor Resistor, Ist order SC filter, IInd order SC filter based on Tow-Thomas.
D/A converters: Weighted resistor, R-2R network, DAC 0808.
A/D converter: Dual slope, Counter ramp, Successive approximation, flash ADC, ADC 0801.

Module III

Voltage Regulators – IC 723 and its Applications, Current boosting, short circuit and fold back protection.
Three terminal regulators, Dual tracking regulators – switching regulators.
PLL – principle- IC 565 –Analysis of lock range and capture range. Applications of PLL.
Waveform generators – IC 8038. IC power amplifiers -IC 380. Comparator IC 311. Timer IC 555 Principle and its application (Astable and Monostable)

Text books

1. Gayakwad: *Op-Amps and Linear Integrated Circuits* , PHI/Pearson Education, 4 ed.
2. K R Botkar: *Integrated Circuits* , Khanna Publishers.

References:

1. Roy Chowdhary: *Linear Integrated Circuits* , New Age International.

2. Sergio Franco, Design with Amplifiers and Analog Integrated Circuits, TMH, 3 ed.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.504 COMPUTER ORGANIZATION (TA) 2-1-0

Module I

Performance Measures and Comparison. SPEC95 - Benchmarks and performances. Instruction Set design principles- Classification of Instruction Set Architecture, Memory Addressing, Operations in the instruction set. Type and size of Operands- Encoding an Instruction Set. Basic DLX - Addressing methods. Operation of Computer hardware- Operands of Computer hardware. Representation of Instructions in Computer. Instructions for making decision. Supporting Procedure in computer hardware. Instruction Operations on character Strings.

Computer Arithmetic- signed and unsigned Numbers. Addition Subtraction. Logical Operations, Construction of ALU, Integer Multiplication and Division. Floating Point Representation, Floating Point Addition and Multiplication.

Module II

Data Path and Control- Single Cycle and Multi cycle Implementation Schemes, Fetch, Decode, Execution, Memory Access, Memory Read and Write. Design of control unit - hardwired & microprogrammed. Microprogramming- Exceptions and Exception handling. Pipelining - overview of Pipelining, Pipelined data path, Pipelined Control, Data hazards and forwarding, Data hazards and stalls, Control hazards, Branch hazards, Exceptions. Super scalar and Dynamic pipelining.

Module III

Memory Hierarchy- Cache design, Data and Instruction Caches, Replacement Policies, Cache Performance, Multilevel Caches, Main memory, Memory Interleaving. Virtual Memory, Design of Virtual Memory, Protection of Virtual Memory. I/O Design- Performance Measures, Buses, Interfacing I/O to Processor. Interrupts and Direct Memory Access. Multiprocessors: Multiprocessors connected by single bus, Cache Coherence, Message Passing Multiprocessors, Clusters.

Text Books:

1. David A Patterson and John L Hennessy: *Computer Organization and Design- the hardware/software interface* Morgan Kaufmann, 2nd Ed.
2. John L Hennessy and D Patterson : *Computer Architecture- A Quantitative Approach* . Morgan Kaufmann.

References:

1. John P Hayes: *Computer Architecture.*
2. Morris Mano: *Computer Architecture.*
3. Hamacher: *Computer Organization.*

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.505 APPLIED ELECTROMAGNETIC THEORY (T) 3-1-0

Module I

Coulomb's law – application. Electrostatic potential, Poisson and Laplace equations, Conductors in electrostatic field, dielectrics in static electric field. Capacitance, capacitor- examples, boundary conditions, capacitors of mixed dielectrics and of complex shapes. Energy stored in electric field, Magneto static fields – Biot-Savart's law, Ampere's law – applications, Inductance, energy stored in magnetic field, Magnetic scalar potential. Magnetic vector potential.

Maxwell's equations, consequences of Maxwell's equations, Boundary conditions, Flow of energy in electromagnetic system , Poynting vector, Complex Poynting vector.

Module II

Electromagnetic waves – Uniform plain EM wave in free space. Propagation of plane EM wave in perfect, in loss-less non-conductors, in conducting media, in good conductors. Reflection and refraction of plane electromagnetic waves at boundaries for normal & oblique incidence – Snell's law of refraction, Brewster angle.

Uniform Transmission lines – lossless lines. Reflection and transmission at the end of a line. Reflection and transmission at a discontinuity on the line. Lossless transmission lines with sinusoidal voltage sources. Reflection, SWR.

Module III

Impedance matching using stub – lines, half wave transformer, quarter wave transformer. Lines with losses – DC line, low frequency line, high frequency line, Smith chart. The hollow rectangular wave guide – modes of propagation of wave, dominant mode, calculation of attenuation in wave guides, Intrinsic Characteristics, Wave impedance. Cylindrical wave guides- TE wave, attenuation. Q factor of wave guides

Text Books :

1. Ashutosh Pramanik: *Electromagnetism, Theory and Applications,* PHI 2003
2. Martin A Plonus: *Applied Electromagnetics,* McGraw Hill.

References:

1. John D. Kraus: *Electromagnetics* , McGraw Hill.
2. Hayt: *Engineering Electromagnetics* , TMH.
3. Edward C Jordan : *Electromagnetic waves and Radiating Systems* , PHI.
4. Matthew N O. Sadiku: *Elements of Electromagnetics* , Oxford University Press.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.506 (1) (Elective –I) NETWORK SYNTHESIS (TA) 3-1-0

Module I (Quantitative Approach)

Network functions, Poles and zeros, driving point functions, positive real functions and properties. Synthesis operation, RC network functions, properties, Foster form of RC Networks.
RL and LC Network functions, Foster form of RL and LC Network. Cauer form of RC, RL and LC Network.

Module II (Quantitative Approach)

Introduction to approximation – method of cut and try. Break point approximation, Network function factors, Combination of factors, Straight line asymplots. Synthesis & LC ladder, RC ladder – synthesis of RC parallel ladders.

Module III (Quantitative Approach)

Butterworth polynomial response, Chebyshev polynomial Frequency transformations, image parameters for symmetrical lattices and constant resistance lattices. Design of filters with resistive termination – ladder equivalent of lattice filters – Design of composite filters.

References:

1. Van Valkenburg : *Introduction to Modern Network Synthesis* , John Wiley.
2. G Daryanani : *Principles of Active Network Synthesis and Design,* John Wiley.
3. Van Valkenburg : *Analog Filter Design* , Oxford University Press

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.506 (2) (Elective –I) DATA STRUCTURES USING C++ (TA) 3-1-0

Module I (Quantitative Approach)

Abstract data types and data structures, classes and objects, complexity of algorithms, worst case, average case and amortised complexity. Lists, Stacks. Queues- implementation. Garbage collection, hash tables and hashing techniques, collision resolution techniques.

Module II (Quantitative Approach)

Trees- Binary trees, Traversal, operations. Binary search trees, decision trees, AVL Trees, Splay trees, redblack trees, B Trees, Tries- operation on tries.

Module III (Quantitative Approach)

Graphs-Representation and operations. Shortest path algorithms, Minimum spanning tree algorithm, Depth first search, Breadth first search, Binary decision diagrams.

Text Book :

1. AV Aho and JD Ullman et al: *Data Structures and Algorithms*, Addison Wesley

References:

1. Robert Kruse et al: *Data Structures and Program Design in C*, PHI
2. D samenta: *Classic Data structures*, PHI
3. Richard F Gilburg, B A Frouzan: *Data Structure: A Pseudocode Approach with C++*, Thomson Learning.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.506 (3) (Elective –I) PROBABILITY & RANDOM PROCESSES (TA) 3-1-0

Module I (Quantitative Approach)

Introduction – Basic concepts – Random experiments & events – Elementary Theorems – Probabilistic Modeling – Histograms – Transformations – Moments – Reliability and failure rates – Transforms of PDF – Tail inequalities - A vector Random variable – The sets – Joint CDF & Joint PDF Conditional Probabilities & Densities – Independence. Transformations – Expectation, Covariance & correlation coefficient – Joint distributions.

Module II (Quantitative Approach)

Introduction to estimation – MMSE estimation – Linear prediction – Dow Jones example – Maximum likelihood estimation. Sequences of Random variables – IID Random variables – Sums & Random sums – weak law and strong law of large numbers – central limit theorem – convergence of sequences – Borel Cantilli Lemmas.

Random processes – Joint CDF and PDF – Expectation, Auto covariance & Correlation functions – continuity, Derivatives and Integrals – Ergodicity - Kaumen Loeve Expansions – Poisson & Gaussian Random Processes.

Module III (Quantitative Approach)

Processing of Random Processes – PSD function – Response of linear systems – optimal linear estimation – Kalman filter – periodo grams – Markov chains – Discrete & continuous time Markov chains. Spectral estimation – Ergodicity – Extrapolation – Mean Square estimation – Prediction – Filtering and Prediction. Queueing theory.

Text Books :

1. Yannis Viniotis : *Probability & Random Processes for Electrical Engineers*, McGraw Hill.
2. Papoulis : Probability, Random Variables & Stochastic Processes, 3rd Edn., McGraw Hill.

Reference :

1. Jorge IAunon, V. Chandrasekar: *Introduction to Probability & Random Processes*, McGraw Hill

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.506 (4) (Elective –I) JAVA & INTERNET PROGRAMMING (TA) 3-1-0

Module I

Introduction to Internet TCP/IP overview. Web server. Web page development using basic HTML scripts. Introduction to Java programming – object oriented programming concepts, java virtual machine, security, java compilers, jdk, java applets, java and internet, web browsers, java interaction with web. Declaration of constants, variables and data types, Java programs for arithmetic operations. Java programs of control and conditional statements, arrays, strings etc. & Java threads.

Module II

Applet programming concepts – Building applet code – Creating executable code for applets. Adding applet to HTML file. GUI programming with Java AWT class. Graphics programming with Java – simple programs for drawing lines, rectangles, ellipse, polygon etc., simple program for creating animation with java. Event handling (handling of mouse events) simple programs. Program for displaying image files.

Module III

Managing input output files using java I/O class. Simple programs for reading and writing files. Exception Handling.

Socket programming with java. TCP and UDP client server programming. Introduction to JDBC.

References:

1. E. Balaguruswami: *Programming with Java A Primer*.
2. Bruce Eckel: *Thinking in Java*, Pearson Education.
3. Dietel and Dietel: *Java How to Program*.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.506 (5) (Elective –I) DIGITAL SYSTEMS DESIGN (TA) 3-1-0

Module I (Quantitative Approach)

Introduction to combinational modules and modular networks. Standard combinational modules, design of arithmetic modules. Implementation of combinational systems with ROM's and PLA's. Comparison with other approaches. Implementation of multimodule combinational systems – decoder networks, Mux trees, demux network, encoder network, shifter network and barrel shifters.

Module II (Quantitative Approach)

Introduction to digital systems. Synchronous and asynchronous – state diagram, state names, mealy and moore machines, binary description. Time behaviour of sync. sequential systems. Minimisation of no. of states. Specification of various types of sequential system.

Module III (Quantitative Approach)

Canonical implementation – analysis and synthesis of networks in the canonical implementation. Flip flop modules and networks. Modular sequential networks. Standard sequential modules. Registers – shift register. Counters – RAM – content addressable memories and programmable sequential arrays (PSA) – Design of sequential systems with small number of standard modules – state register and combinational networks – RAM and combinational networks – SR and combinational networks. Multimodule implementation of sequential systems – Multimodule registers – Shift registers and RAMs – Multimodule counters – Sequential arrays – Introduction to hardware / Firmware algorithms.

References :

1. Milos D. Ercegovac, Tomas Lang: *Digital Systems and Hardware / Firmware Algorithm*, John Wiley
2. William I Fletcher: *An Engineering Approach to Digital Design*, Prentice Hall.
3. Hayes: *Digital System Design and Microprocessors*, McGraw Hill.
4. John B Peatman: *Digital Hardware Design*, McGraw Hill.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.506 (6) (Elective –I) LOGIC SYNTHESIS (TA) 3-1-0

Module I (Quantitative Approach)

Introduction to Computer Aided Logic Synthesis and Optimization. Circuit Models. Architectural and Logic Synthesis and Optimization. Testing and Verification. Graphs and Data Structures- Introduction. Directed and Undirected Graphs. Perfect Graphs. Combinatorial Optimization. Graph Optimization Problem and Algorithms. Boolean Algebra and Applications. Boolean function representation. Satisfiability and Cover. Data structures for graphs, Binary Decision Diagrams (BDD), OBDD, ROBDD, logic networks. Two level Synthesis and Optimization Logic Optimization Principles. Operations on Two Level Logic Covers. Algorithms for Logic Minimization: Expand, Reduce, irredundand, Essentials, The ESPRESSO Minimizer. Symbolic Minimization and Encoding Problems. Minimization of Boolean Relations.

Module II (Quantitative Approach)

Multiple Level Combinational Logic Optimization Introduction, Models and Transformation for Combinational Networks. Optimization of Logical Networks. Transformations for Logical Networks, The Algorithmic Approach to Multiple-Level Logic Optimization. The Algebraic model, Substitution, Extracting and Algebraic Kernels, decomposition. The Boolean Model, Don't care conditions and their computations, Boolean simplification and substitution. Other optimization algorithms using boolean transformation. Synthesis of Testable Networks, Algorithms for delay evaluation and optimization, Delay modeling, Detection of false paths, Algorithms and Transformation for delay optimization. Rule based systems for Logic Optimization

Module III (Quantitative Approach)

Sequential Logic Optimization Introduction. Sequential circuit Optimization using State-based models, State minimization, State encoding, Other optimization methods and recent developments. Sequential circuit optimization using Network models, Retiming, Synchronous circuit optimization by retiming and logic Transformations, Don't care conditions in Synchronous Networks. Implicit Finite-state machine traversal methods, state extraction, Implicit state minimization. Testability considerations for synchronous circuits.

References:

1. Giovanni De Micheli: *Synthesis and Optimization of Digital Circuits* ,McGraw-Hill.
2. Frederick J Hill, GR Peterson: *Computer Aided Logical Design with Emphasis on VLSI* , 4 ed, Wiley.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.506 (7) (Elective –I) ELECTRONIC PRODUCT DESIGN (TA) 3-1-0

Module I

Definition of a product, Product Classification, New Product development process. Product design methodology, Product planning, data collection. Creativity techniques. Elements of aesthetics. Ergonomics. Control panel organization. Electronic systems and needs. Physical integration of circuits, packages, boards and full electronic systems. Introduction to reliability, Reliability considerations in electronic products, Effect of reliability on product design and pricing.

Module II

Packaging levels; electrical design considerations – power distribution, signal integrity and parasitics. Wireability issues. CAD for Printed Wiring Boards (PWBs); PWB Technologies, MCMs, flexible and 3-D packages.

Module III

Recent trends in manufacturing like microvias and sequential build-up circuits. Joining methods in electronics-solders and their alternates. Surface Mount technology and assembly; other advanced chip connection methods. Thermal management of PWBs, Electrical test.

Introduction to product support documentation, classifications, Influencing factors. Design of brochures, contents of brochures.

Text Books:

1. Ernest J Mccormick: *Human Factors in Engg. And Design* ,McGraw Hill Co. Ed.
2. Rao R. Tummala: *Fundamentals of Microsystems Packaging* ,McGraw Hill, N Y 2001

References:

1. Flurschiem CH: *Industrial Design and Engg.* ,Design Council, London and Springer Verlag, 1983
2. Web based Current literature, IEEE Press 1999.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.507 DIGITAL ELECTRONICS LAB (TA) 0-0-4

1. Characteristics of TTL and CMOS gates.
2. Realization of logic circuits using TTL /CMOS (NAND /NOR) gates.
3. Arithmetic circuits -Half adder, Full adder, 4 bit adder/subtractor, BCD adder-7483 circuits.
4. Astable and Monostable multivibrators using TTL/CMOS gates and 555.
5. Realization of RS, T, D, JK and Master Slave flip-flops using gates.
6. Shift Registers, ring counter and Johnson counter (using gates and 7495)
7. Counters, up/down counters (asynchronous & synchronous) using flip flops.
8. Counter ICs, Sequence generator.
9. BCD to Decimal and BCD to 7 segment decoder & display
10. Multiplexers, Demultiplexers using gates and ICs.
11. Realisation of combinational circuits using MUX & Demux.
12. Astable & Monostable using 74123.
13. Introduction to VHDL

Note: For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design -25%
(b) Result & Performance -50%
(c) Viva voce -25%
Practical examination to be conducted covering entire syllabus given above.

03.508 INTEGRATED CIRCUITS LAB (T) 0-0-4

1. Operational amplifiers-Familiarization-Measurement of parameters. Inverting and Non inverting amplifiers, frequency response, Adder, Differentiator, Integrator, Difference Amplifier and Instrumentation amplifier.
2. Wien bridge oscillator using op-amplifier with amplitude stabilization, RC Phase shift Oscillator.
3. Triangular and square wave generators using op amplifier.
4. Voltage comparator ICs, Window Comparator.
5. IC voltage regulators (723), Short circuit and Fold back protection.
6. Astable, Monostable and Schmitt trigger circuit using Op Amps.
7. Precision rectifiers using Op-Amp.
8. Active second order filters using Op-Amp (LPF, HPF, BPF and BSF)
9. Filters using gyrator circuits.
10. A/D converters- counter ramp and flash type.
11. D/A Converters- ladder circuit.

Note: For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design -25%
(b) Result & Performance -50%
(c) Viva voce -25%
Practical examination to be conducted covering entire syllabus given above.

03.601 DIGITAL SIGNAL PROCESSING (TA) 3 -1-0

Module I (Quantitative Approach)

DSP & its benefits – Key DSP operations – Real world applications of DSP – Applications in Audio, Telecommunication & Biomedical. Sampling of continuous time signals – Anti-aliasing filters – Reconstruction filters. DFT – DFT & its properties – Linear filtering methods – Computation of DFT – FFT Algorithms and Applications - Quantization effects in the computation of DFT.

Module II (Quantitative Approach)

Digital filter structures, Block diagram & signal flow graph representation – Basic FIR & IIR structures – State Space Structures – All pass filters. Digital filter design – IIR filter design – Impulse invariance & Bilinear methods – FIR filter design based on window methods (Truncated fourier series, Bartlett, Blackman, Hanning, Hamming, Kaiser) & frequency sampling approach.

Module III (Quantitative Approach)

Adaptive digital filter – basic concepts and applications. Quantization & Round off effects in digital filters. Multirate DSP – Sampling rate alteration devices – Filters – Design of decimator and Interpolator. Digital Signal Processors – Architectures for signal processing – General purpose processors – Special purpose DSP hardwares. Application and design studies – Evaluation boards for real time signal processing – Detection of fetal heart beats, Equalization of digital audio signals – Spectral analysis of audio signals, Transmultiplexers, Multitone transmission of digital data.

Text Books :

1. Module I Ref (1), (2) & (3) ; Module II Ref (1), (2), (3) & (4); Module III Ref (1) & (3)

References :

1. Sanjith K Mitra : *Digital Signal Processing*, 2nd edn., Tata McGraw Hill, New Delhi.
2. John G Proakis, Dimitris G Manolakis -*Digital Signal Processing* , 3rd ed., Prentice Hall of India, New Delhi.
3. Emmanuel C. Ifeachor, Barrie W. Jervis: *Digital Signal Processing* , 2nd edn., Pearson Education /PHI
4. A V Oppenheim & Ronald W .Schafer: *Discrete Time Signal Processing* , 2nd edn., Prentice Hall of India, New Delhi.
5. Ramesh Babu P.,*Digital Signal Processing* , Scitech Publications (India) Pvt.Ltd.

6. Steven W Smith :*The Scientist and Engineer's Guide to Digital Signal Processing* ,California Technical Publishing, San Diego, California.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.602 MICROPROCESSORS (TA) 3-1-0

Module 1

General architecture of a microprocessor, hardware architecture of 8086, addressing modes, instruction set, instruction templates, instruction execution timing. Assembly language programming, programming examples. Modular programming – Assembler instruction format, Different programming models, Assembler directives and operators, Assembly process, Linking and relocation, stacks, procedures, interrupt routines, macros.

Module II

8086 hardware design - Bus structure, bus buffering and latching, system bus timing with diagram, memory (RAM and ROM) interfacing, memory address decoding, I/O interfacing – serial and parallel I/O, Programmed I/O, Interrupts and their processing, interrupt driven I/O. Minimum and maximum mode configurations of 8086, 8087 co-processor architecture and configuration. Comparative study of 80386, Pentium Architecture and 68000 Processors.

Module III

Study of support chips – 8255 – Programmable peripheral interface, 8251 – Universal synchronous Asynchronous Receiver Transmitter, 8259 – Programmable Interrupt controller, 8279 – Programmable Keyboard /Display Interface, 8257 – Programmable DMA Controller, 8288 – Bus controller, 8253 – Programmable Interval Timer, 8086 based system architecture and design with these support chips.

Text Books:

1. Douglas V .Hall :*Microprocessors and Interfacing* ,TMH, New Hill
2. Barry B Bray :*The Intel Microprocessor 8086/80866, 80186/80188, 80236, 80386, 80486, Pentium and Pentium Pro* , Pearson Education Asia.

References :

1. Peter Abel :*IBM PC Assembly Language Programming* , PHI.
2. M .Rafiquzzaman :*Microprocessor Theory and Application,* PHI.
3. Yu Chen Liu & Glenn A Gibson :*Microcomputer Systems; The 8086/8088 Family* , PHI, New Delhi.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.603 INDUSTRIAL ELECTRONICS & INSTRUMENTATION (T) 2–1-0

Module I

Power diodes- characteristics, power diode types, diodes with RC, RL, LC and RLC loads. Thyristors – characteristics, two-transistor model, turn on and turn off, thyristor types, firing circuits.

Power transistors- Power BJT, Power MOSFET, SIT and IGBT, steady state and switching characteristics of Power MOS, drive requirements. Controlled rectifiers- principle of phase controlled converter operation. Single phase and three phase semi converters, full converters, and dual converters, power factor improvements, design of converter circuits.

Module II

Switch mode converters – Buck, Boost, Buck-Boost converters. Derived DC – DC converters – Fly back, Forward, Push pull and half bridge converters. Overview of switching power supplies.

Basic configuration of switched mode inverters, UPS, Power line disturbance and EMI Filters.

Introduction to motor drive system – DC motor drives – v/f control of induction motor.

Measurement of resistance, inductance and capacitance using bridges - Wheatstone, Maxwell, Megger, Q meter, Electronic multimeter, RF power meter.

Module III

Digital instruments: Digital voltmeter - successive approximation type, Digital measurement of time interval, phase, period, frequency, ratio of two frequencies, Digital LCR meter.

Signal generators - Audio generators, Function generators, Sweep frequency generators, Pulse generators, RF generators.

Cathode Ray Oscilloscope – dual trace and dual beam oscilloscopes.

Special oscilloscopes - Delayed time base oscilloscope and controls. Analog Storage oscilloscope and controls.

Sampling oscilloscopes - Digital storage oscilloscope – Operation –controls – applications. Spectrum analyzers, Logic State analyzers.

Text Books

1. Ned Mohan et. al. : *Power Electronics : Converters, Applications and Design* , John Wiley and Sons.
2. Md. H. Rashid: *Power Electronics : Circuits, Devices and Applications 2/e* , Pearson Education.
3. D A Bell : *Electronic Instrumentation and Measurements* , PHI, 2003
4. Helfrick & Cooper: *Modern Electronic Instrumentation and Measurement Techniques* , PHI

References

1. P.C Sen: *Modern Power Electronics* , Wheeler Publishers.
2. Joseph Vithayathil: *Power Electronics: Principles and Applications* . McGraw Hill
3. Pressman: *Switching Power Supply Design* . McGraw Hill
4. Joseph J. Carr : *Elements of Electronic Instrumentation and Measurements* , 3/e, Pearson Education India.
5. Ernest Doebelin: *Measurement Systems* , 5th Edn., McGraw Hill.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.604 DIGITAL COMMUNICATION (T) 2-1-0

Module I (Quantitative Approach)

Pulse modulation – Sampling process – PAM – Quantization – PCM – Noise in PCM system - TDM – Digital multiplexers – Modifications of PCM – Delta modulation – DPCM – ADPCM – ADM. Baseband pulse Transmission – Matched filter - Error rate due to noise – ISI – Nyquist criterion for distortionless transmission – Correlative level coding – Baseband M-ary PAM transmission – eye pattern – optimum linear receiver – Adaptive equalization.

Module II (Quantitative Approach)

Signal space Analysis – Geometric representation of signals – Conversion of the continuous AWGN channel in to a vector channel – Likelihood function – Coherent detection of signals in noise – correlation receiver – probability of error. Passband Digital Transmission – Transmission model – coherent phase shift keying – Hybrid amplitude and phase modulation schemes – coherent frequency shift keying – Detection of signals with unknown phase – Non coherent orthogonal modulation – Differential phase shift keying – Comparison of digital modulation schemes.

Module III

Application of passband transmission – Voice band Modems – Multichannel modulation – Discrete multitone. Synchronization. Spread spectrum communication – Pseudo–noise sequences – Spread Spectrum – Direct sequence spread spectrum with coherent binary phase shift keying – Signal space dimensionality and processing gain – Probability of error – Frequency Hop spread spectrum – Maximum length and Gold codes. Multiple Access Techniques. Statistical characterization of multipath channels. Binary signaling over a Rayleigh fading channel – Diversity techniques. TDMA and CDMA – RAKE receiver. Source coding of speech.

Text book:

Simon Haykin - Communication systems – 4th edition - John Wiley & sons, Inc.

References:

1. Bernard Sklar : *Digital Communication,* 2nd Edn., Pearson Education, 2001.
2. Harold Kolimbris : *Digital Communication Systems,* 1st edn., Pearson Education, 2000.
3. Marvin K. Simon, Sami M. Hinedi, William C. Lindsey : *Digital Communication Techniques* , PHI.
4. Couch: *Digital and Analog Communication Systems* , 6th edn., Pearson Education.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.605 ANTENNA & WAVE PROPAGATION (T) 2-1-0

Module I (Quantitative Approach)

Basic antenna parameters - gain, directivity, beam solid angle, beam width and effective aperture calculations. Effective height -wave polarisation - antenna temperature - radiation resistance - radiation efficiency - antenna field zones - principles of reciprocity. Concept of retarded potential - field and radiation resistance of a short dipole - field and radiation resistance of a half wave dipole – duality of antennas – radiation from pulsed center-fed dipole antenna.

Module II (Quantitative Approach)

Arrays of point sources - field of two isotropic point sources - principle of pattern multiplication - linear arrays of 'n' isotropic point sources -maximum, null and beamwidth calculations of broad side and end fire arrays - binomial arrays. Principle and applications of V antenna - helical antenna - log periodic antenna - dish antenna and phased arrays. Biconical antenna – characteristic impedance of infinite biconical antenna, input impedance of finite biconical antenna. Measurement of radiation pattern, gain, directivity and impedance.

Module III (Quantitative Approach)

Radio wave propagation –Modes – structure of atmosphere – characteristics of ionized regions – sky wave propagation – effect of earth's magnetic field – derivation of Appleton-hartree formula –MUF – skip distance – Ionospheric abnormalities and absorption –Multihop propagation – space wave propagation – dual propagation – VHF and UHF Mobile radio propagation – Tropospheric Scatter Propagation – VLF and ELF propagation into sea water.

Text Books :

1. John D. Krauss: *Antennas for all Applications 3rd Edn.,TM*H.
2. K D. Prasad: *Antenna and Wave Propagation* ., Satyaprakashan, 2000, New Delhi.

References:

1. R E Collin: *Antennas & Radio Wave Propagation,* McGraw Hill.
2. Terman: *Electronics & Radio Engineering* .,McGraw Hill.
3. E.C. Jordan & K G Balmain: *Electromagnetic Waves & Radiating Systems* , 2nd Edn., PHI.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.606 (1) (ELECTIVE – II) DESIGNING WITH VHDL (TA) 3-1-0

Module I

Identifiers, data objects, Data types, and operators in VHDL. Entity declaration. Architecture modeling - structural, behavioral & data flow. Constant, signal, aliases, and variable assignments. Conditional statements – if ..then ..else , when..else, with select , and case statements. Loop statements – for, while, loop, and generate statements. exit, next, block, assertion, and report statements. Generics. Configurations - specification declaration, default rules, conversion functions, instantiation, and incremental binding.

Module II

Subprograms - functions and procedures, operator overloading. Packages and libraries – package declaration, package body, design of file, design of libraries. Attributes - user defined and predefined. Introduction to test bench generation –waveform generation, wait statement, text file reading and dumping results in text file. Testing – fault models, different faults. Fault simulation - ATPG, DFT, boundary scan, and BIST

Module III

Top-down design, FSM implementation in VHDL - design issues in synchronous machines-clock skew, gating the clock, asynchronous inputs. synchronizer failure, metastability resolution time, reliable synchronizer design. Moore & Mealy machines. State encoding, interacting state machines. Introduction to CPLD, FPGA & design with CPLD and FPGA.

Text Books:

1. Kevin Skahill.: *VHDL for Programmable Logic* , Addison & Wesley.
2. John F. Wakerly: *Digital Design Principles and Practices,* PHI.
3. J Bhasker :*VHDL Primer* , Pearson Education.

References:

1. Nawabi.:*VHDL - Analysis and Modelling of Digital Systems* ., 2nd ed., McGraw Hill.
2. Douglas Perry:*VHDL* , McGraw Hill.
3. VHDL, IEEE Standard Reference Manual.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. (60% weightage to be given to programming.)

03.606 (2) (ELECTIVE – II) LINEAR ALGEBRA & APPLICATIONS IN ELECTRONICS (TA) 3-1-0

Module I (Quantitative Approach)

Linear Models in Engineering – Systems of linear equations, Row reduction and Echelon forms, Vector equations, Matrix equation, Solution sets of linear systems, Linear independence, Linear transformation, Models in Engineering, Matrix operations, Invertible Matrices, Partitioned Matrices, Matrix factorizations, Solutions of linear systems, Leontief Input-Output Model, Application to Computer Graphics.

Module II (Quantitative Approach)

Determinants – Properties – Grame's Rule, Volume and linear transformations. Vector spaces & Sub spaces, Null & Column spaces, Linear transformations, Bases, Co-ordinate systems, dimension, Rank, Change of basis, Application to difference equations and Markov Chains. Eigen values & Eigen Vectors – Characteristic equation, diagonalization, linear transformations, complex Eigen values, discrete dynamical systems, Application to differential equations.

Module III (Quantitative Approach)

Orthogonality & Least – squares – Inner product, length and orthogonality, Orthogonal sets & projections, Gram – Schmidt Process, Least – Squares Problems, Inner product spaces, Applications of Inner Product spaces. Symmetric Matrices & quadratic forms – Constrained optimization, singular value decomposition, Application to Image processing. Numerical Techniques-Gaussian elimination, LU decomposition, Practical difficulties in solving equations, Iterative methods for solving linear equations.

Text Books :

1) David C Lay :*Linear Algebra and its Applications* , 2nd Edn., Peason Education Asia
2) Gareth Williams: *Linear Algebra with Applications,* 4th Edn., Jones & Bartlett, Mathematics.
3) Arch W Naylor R Sell: *Linear operator Theory* , Vol 40 , Springer

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.606 (3) (ELECTIVE – II) FUZZY SYSTEMS (TA) 3-1-0

Module I (Quantitative Approach)

Introduction to Fuzzy sets and systems. Basics of fuzzy sets, membership function, support of a fuzzy set, height - Normalised fuzzy set, - cuts (decomposition of a fuzzy set), set theoretic definitions on fuzzy sets, complement, intersection and union equality, subsethood - basic definition based on membership functions. The law of the excluded middle and law of contradiction on fuzzy sets. Properties of fuzzy sets operations (logical proof only). Extension of fuzzy sets concepts - type-2 and level 2 fuzzy sets - examples.

Module II (Quantitative Approach)

Operations on fuzzy sets - intersection, algebraic sum - product, bounded sum - product, drastic sum product, t-norms and t-conorms (s - norms) on fuzzy sets, typical parameterised t - norms and s-norms (with simplified proof). Extension principle and its applications. Fuzzy relation. Resolution form of a binary fuzzy relation. Operations on fuzzy relations - projection, max.-min. and min and max, compositions cylindric extension. Similarity relations - Reflexivity, symmetry, transitivity. Further operations on fuzzy sets, concentration, dilation, contrast intensification, linguistic hedges.

Module III (Quantitative Approach)

Logical operations on fuzzy sets – Negation – Conjunction, disjunction, implication, fuzzy inference. Block diagram of a fuzzy logic system. Fuzzy rule base – simplification of compound rule base – fuzzy inference – max. – min, man product, man drastic product, man bounded product. Defuzzification – Centre of gravity, center of sums, weighted average etc. Fuzzy pattern recognition-Feature analysis, Partitions, Identification, Multifeature recognition. Fuzzy control systems-Review of control theory for fuzzy controls, Simple controllers, General controllers, Stability, Models, Inverted pendulam, Aircraft landing control, Airconditioner control.

Text Books:

1. C.T Lin & C S George Lee: *Neural Fuzzy Systems* , Prentice Hall. (Module 1, 2, 3)
2. Ahamad M. Ibrahim : *Introduction to Applied Fuzzy Electronics* , PHI. (Module 3)
3. S. Rajasekharan, G A Vijayalakshmi Pai: *Neural Networks, Fuzzy logic and Genetic Algorithms,* PHI.
4. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 2/e, McGraw Hill.

References:

1. Earl Cox: *Fuzzy Systems Handbook* , Associated Press
2. Klir and Yuan: *Fuzzy Sets and Fuzzy Logic- Theory and Applications* , Prentice Hall of India.
3. Bart Kosko: *Fuzzy Engineering* , Prentice Hall.
4. Bart Kosko: *Fuzzy Thinking* , Hooper Collins Publications.
5. Yen: *Fuzzy Logic: Intelligence, Control and Instrumentation* , Pearson Education, 2002

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.606 (4) (ELECTIVE – II) ANALOG CIRCUIT DESIGN (TA) 3-1-0

Module I

Basic MOS device physics, MOS I/V characteristics. MOS device layout, device capacitance, small signal model. Single stage MOS amplifiers –CS, CD, CG and cascode amplifiers, gain and frequency response, class B and class AB amplifiers.

Differential Amplifiers, MOS load, Current source, Current mirror, cascode load.

Noise in CS, CG, CD and Differential amplifiers.

Module II

MOS Operational Amplifiers, one stage- cascode and folded cascode, two stage op-amp, Common mode feed back, Input range limitation, Noise in Op-amp, frequency compensation and slew rate in two stage Op-amps.

Basic MOS Op-amp design, op-amp with output buffer, device sizes. Basic structure of operational Trans-conductance amplifiers-High speed MOS op-amp, MOS comparator, Analog MOS Multipliers - basic principles.

Module III

CMOS Switch, sample and hold circuit, switched capacitor Integrator, Summing amplifiers, double Integrator biquad, higher order SC filter - realization using first order and second order, CMOS charge scaling DAC, Cyclic and pipeline DAC, CMOS charge distribution ADC, charge pump PLL, CMOS VCO, PFD using charge pump, CMOS Voltage reference, Band gap voltage reference.

Text Books:

1. Behzad Razavi: *Design of Analog CMOS Integrated Circuits,* TMH 2002.
2. R Jacob Baker, Harry W. Li, David E Boyce *CMOS Circuit Design, Lay out and Simulation* - IEEE press, 2002.

Reference:

K R Botkar : *Integrated Circuits,* 10th edn., Khanna Publishers

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.606 (5) (ELECTIVE – II) ELECTRONIC MATERIALS (TA) 3-1-0

Module I

Crystallography and crystalline Defects: Crystallography, Directions and planes, Crystalline defects, line defects, Planar defects, Volume defects, Gettering in Si. Metallization and Phase Diagrams: Lever rule and phase rule, Eutectic system, silicide metallization, Ternary phase diagrams, Metal Si & O_2 interactions. Oxidation of silicides, Metal GaAs interaction, Stable Metallization for GaAs.

Module II

Reaction kinetics: Silicides, Aluminides and diffusion barrier, Silicide formation, Al-Pd_2Si interactions, Al Au interactions, diffusion barrier Alloy- Si interactions. Use of band theory and occupation statistics to explain existence and basic properties of metals and nonmetals, Optical absorption in SC, light emission from SC. Binary III-V compounds, Mixed crystals.

Module III

Applications of Electronic Materials – Microelectronics – microelectronic semiconductor devices. Opto-electronics – materials for opto electronic devices – Quantum electronics – superconducting materials – applications of superconductors – Magnetic materials – Magnetic recording materials – electronic materials for transducers – Sensors and actuators – electronic materials for radiation detection.

Text Book:

JW Mayer & S.S. Lau: *Electronic Material Science for Integrated Circuits in Si & GaAs*, PHI, 1990.

Reference :

D. Jiles : *Introduction to the Electronic Properties of Materials,* Chapman & Hall. 1994.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.606 (6) (ELECTIVE – II) GRAPH THEORY (TA) 3-1-0

Module I (Quantitative Approach)

Graphs – Application of graphs – Finite and Infinite graphs – Incidence and Degree – Isolated Vertex, Pendant Vertex and Null Graph – Isomorphism – Sub graphs – Walks, Paths and Circuits – Connected Graphs, Disconnected graphs and Components – Euler Graphs – Operations on Graphs – Hamiltonian Paths and Circuits. Trees – Pendant Vertices in a Tree – Distance and Centers in a Tree – Rooted and Binary Trees – On Counting Trees – Spanning Trees – Fundamental Circuits – Finding All Spanning Trees of a Graph – Spanning Trees in a Weighted Graph. Cut-Sets – All Cut-Sets in a Graph – Fundamental Circuits and Cut-Sets – Connectivity and Separability – Network Flows – 1-Isomorphism, 2-Isomorphism.

Module II (Quantitative Approach)

Combinatorial and Geometric Graphs – Planar Graphs – Different Representations of a Planar Graph – Detection of Planarity – Geometric Dual – Combinatorial Dual. Sets with one operation – sets with two operations – Modular Arithmetic and Galois Fields – Vectors and Vector spaces – Vector space Associated with a graph – Basis vectors of a graph – Circuit and Cut-set subspaces – Orthogonal vectors and spaces. Incident Matrix – Submatrices of A(G) – Circuit Matrix – Fundamental Circuit Matrix and rank of B – Cut-Set Matrix – Relationships among A_f, B_f and C_f - Path Matrix – Adjacency Matrix.

Module III (Quantitative Approach)

Chromatic Number – Chromatic Partitioning – Chromatic Polynomial – Matchings – Coverings.
Directed Graph – Digraphs and Binary Relations – Directed Paths and Connectedness – Euler Digraphs – Trees with Directed Edges – Fundamental Circuits in Digraphs – Matrices A, B and C of Digraphs – Adjacency Matrix of a Digraph. Enumeration of Graphs – Counting Labeled Trees – Counting Unlabeled Trees. Contact Networks – Analysis of Contact Networks – Synthesis of Contact Networks – Sequential Switching networks – Unit cube and its graph - Graphs in Coding Theory.

Text Book:

Narasingh Deo : *Graph Theory with Applications to Engineering and Computer Science*, PHI

Reference:

1. Harary: *Graph Theory*, Narosa Publishing House.
2. V K Balakrishnan: *Graph Theory*, Schaum's Series.
3. Reinhard Diestel : *Graph Theory*, Springer – Verlag.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.606 (7) (ELECTIVE – II) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS (TA) 3-1-0

Module I

Definition - history and applications - propositional calculus - predicate calculus - inference rules - structures and strategies for state space search - heuristic search algorithms - heuristics in games - complexity issues - control and implementation of state space search - production systems - planning - the blackboard architecture Introduction to understanding natural language - introduction to automated reasoning - introduction to machine learning

Module II

Knowledge intensive problem solving - expert system technology - rule-based expert systems -model based reasoning - case based reasoning - knowledge representation problem - reasoning with uncertain or incomplete information - statistical approach - non-monotonic systems - fuzzy sets - knowledge representation - languages - issues - network representation - conceptual graphs - structured representation

Module III

Languages and programming techniques for AI - overview of LISP - search - higher order functions and procedural abstractions - search strategies - pattern matching - recursion - interpreters - logic programming in LISP - streams and delayed evaluation - expert system shell in LISP - network representations and inheritance - CLOS

Text book:

Luger G.F. & Stubblefield W.A., *Artificial Intelligence*, Addison Wesley

References:

1. Nilsson N.J., *Artificial Intelligence - A New Synthesis*, Harcourt Asia Pte. Ltd
2. Elain Rich & Kevin Knight, *Artificial Intelligence*, Tata McGraw Hill
3. Tanimotto S.L., *The Elements of Artificial Intelligence*, Computer Science Press
4. Winston P.H., *LISP*, Addison Wesley

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.607 COMMUNICATION ENGINEERING LAB (T) 0 -0- 4

1. Amplitude modulation and demodulation.
2. Frequency modulation and demodulation using PLL.
3. Frequency multiplier and Frequency synthesizer using PLL.
4. Pseudo Random Binary Sequence Generator.
5. Pre-emphasis and De-emphasis.
6. Clock recovery using PLL.
7. Mixer circuit using ICs.
8. Automatic Gain Control.
9. PWM, PPM, PAM Modulation & Demodulation.
10. Delta Modulation & Demodulation.
11. Amplitude Shift Keying Modulator and Demodulator.
12. Frequency Shift Keying Modulator and Demodulator.
13. Digital Phase Detector.
14. Time Division Multiplexing.
15. Binary PSK Modulator & Demodulator.

Note:

For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design -25%
(b) Result & Performance -50%
(c) Viva voce -25%

Practical examination to be conducted covering entire syllabus given above.

03.608 MINI PROJECT (TA) 0-0-4

Each student should conceive, design develop and realize an electronic product. The basic elements of product design - the function ergonomics and aesthetics - should be considered while conceiving and designing the product. The electronic part of the product should be an application of the analog & digital systems covered up to the 6th semester. The realization of the product should include design and fabrication of PCB. Study of PCB design (single sided and double sided) may use any available software. The student should submit the report at the end of the semester. The product should be demonstrated at the time of examination.

Note:

For University examination, the following guidelines should be followed regarding award of marks:

(a) Demonstration - 30%
(b) Completeness and Novelty - 30%

(c) Viva Voce - 40%

03.701 VLSI CIRCUIT DESIGN (TA) 3-1-0

Module I

Introduction to integrated circuit fabrication Wafer processing, oxidation, Epitaxy, Deposition, Ion implantation and diffusion (Basics only), CMOS technology – n well, p well, and twin tub process –SOI – fully depleted and partially depleted SOI devices. Interconnects and circuit elements – Resistors and capacitors, Lay out designing rules and SOI rules. (λ and μ rule)

Module II

MOS transistor theory- Long channel MOSFET, Short channel effects of MOSFET – Velocity saturation, Channel length modulation, source drain series resistance effect, Second order effects of MOS characteristics. CMOS inverter.

DC characteristics, Noise margin – Static load inverters, pseudo NMOS, Saturated load inverters. Propagation delays, Power dissipation – Static and dynamic. CMOS logic design - Pass transistor logic, Domino logic, np-CMOS.

Module III

CMOS circuit design & implementation of Adder – Full adder, Dynamic adder, Carry bypass adder, Carry select adder, Square root carry selector adder, Carry look head adder, Multipliers, and array multipliers. Memory elements- SRAM, DRAM, ROM, Sense amplifiers – Differential, Single ended. Reliability and testing of VLSI circuits – General concept, CMOS testing, Test generation methods.

Text Books:

1. Jan M Rabaey: *Digital Integrated Circuits,* 2nd ed., Pearson Education, 2003 / PHI
2. John P Uyemura: *Introduction to VLSI Circuits and Systems* .

References:

1. Neil H E Weste & Kamran Eshrahian: *Principles of CMOS VLSI Design* , Addison Wesley, India.
2. Yuan Taur, Tak H ning : *Fundamentals of Modern VLSI Devices* , Cambridge Uni. Press
3. S K Gandhi: *VLSI Fabrication Principles* ., Prentice Hall.
4. C A Mead & L A Conway: *Introduction to VLSI Systems* , Addison Wesley Publishing Company.
5. Wayne Wolf : *Modern VLSI Design Systems on Chip* – Pearson Education, 2nd ed.
6. Baker, Li, Boyce: *CMOS,* PHI.
7. Pucknell, *VLSI Design,* PHI.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03 .702 INFORMATION THEORY AND CODING (T) 3-1-0

Module I (Quantitative Approach)

Introduction to Information Theory : Concept of amount of information, units- entropy, marginal, conditional and joint entropies - relation among entropies -mutual information, information rate.

Source coding : Instantaneous codes- construction of instantaneous codes - Kraft's inequality, coding efficiency and redundancy, Noiseless coding theorem - construction of basic source codes - Shannon - Fano Algorithm, Huffman coding, Lempel - Ziv algorithm, run length encoding, JPEG standard for loss less and lossy image compression.

Channel capacity -redundancy and efficiency of a channel., binary symmetric channel (BSC), Binary erasure channel (BEC)- capacity of band limited gaussian channels, Shannon-Hartley theorem - bandwidth - SNR trade off - capacity of a channel of infinite bandwidth, Shannon's limit.

Module II (Quantitative Approach)

Codes for error detection & correction - parity check coding - linear block codes - error detecting and correcting capabilities - generator and parity check matrices - Standard array and syndrome decoding –Perfect codes, Hamming codes - encoding and decoding, cyclic codes – polynomial and matrix descriptions- generation of cyclic codes, decoding of cyclic codes, BCH codes - description & decoding, Reed-Solomon Codes, Burst error correction - block and convolutional interleaving.

Module III (Quantitative Approach)

Convolutional Codes - encoding - time and frequency domain approaches, State, Tree & Trellis diagrams - transfer function and minimum free distance- Maximum likelihood decoding of convolutional codes - The Viterbi Algorithm. Sequential decoding, Trellis Coded Modulation.

Cryptography: Secret key cryptography, block and stream ciphers, DES, Public key cryptography, Diffie -Hellman Public key distribution -RSA algorithm, Pretty Good Privacy, digital signatures.

Text Books:

Module I

1. Ref (1) (ch 9)
2. Ref (2) (ch 13)
3. Ref (3) (ch 1,2)
4. Ref (4) (ch 1,2,3,4)
5. Ref (6) (ch 5)
6. Ref (6) (ch 4)

Module II

(1) Ref (5) (ch 3,4,6,9)
(2) Ref (4) (ch 5)
(3) Ref (1) (ch 10)
(4) Ref (3) (ch 3,4,5)
(5) Ref (2) (ch 13)

Module III (1) Ref (5) (ch 10,11,12) **(2)** Ref (4) (ch 5), **(3)** Ref (1) (ch 11, Appendix 10), **(4)** Ref (2) (ch 13), **(5)** Ref (3) (ch 6,7,8) **(6)** Ref (6) (ch 4)

References

1. Simon Haykin: *Communication Systems*, 4th ed., John Wiley & Sons Pvt. Ltd.
2. Taub & Schilling: *Principles of Communication Systems*, 2nd ed., TMH, New Delhi.
3. Ranjan Bose.: *Information Theory, Coding and Cryptography*, TMH, New Delhi
4. Dr. P.S. Sathya Narayana: *Concepts of Information Theory & Coding*, Dynaram Publications, Bangalore.
5. Shu Lin & Daniel J. Costello Jr.,: *Error Control Coding : Fundamentals and Applications*, Prentice Hall Inc., Englewood Cliffs, N.J.
6. Das, Mullick & Chatterjee: *Principles of Digital Communication*, Wiley Eastern Ltd.

Question Paper

The question paper will consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This will contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There will be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.703 MICROWAVE ENGINEERING (T) 2-1-0

Module I (Quantitative Approach)

Introduction, Resonators - Rectangular and Circular wave guide resonators. Limitations of vacuum tubes at microwave frequencies. Klystrons - Re-entrant cavities, Velocity modulation, Bunching (including analysis), Output power and beam loading, Reflex Klystron, Power output and efficiency, Admittance. Travelling wave tubes – Slow wave structures, Helix TWT, Amplification process, Convection current, Axial electric field, Wave modes, Gain consideration.

Module II (Quantitative Approach)

Magnetron oscillators – Cylindrical magnetron, Cyclotron angular frequency, Power output and efficiency. Solid state microwave devices – Microwave bipolar transistors – Physical structures, Power-frequency limitations. Heterojunction bipolar transistors – Physical structures. Principle of operation of Tunnel diode, MESFET. Gunn diodes - Gunn oscillation modes. Working principles of Avalanche diode oscillators (no analysis).

Module III (Quantitative Approach)

Microwave hybrid circuits – Waveguide tees, Magic tees, Hybrid rings, Corners, Bends, Twists. Formulation of S-matrix. Directional couplers – Two hole couplers, S-matrix of a directional coupler. Circulators and isolators. Measurement of Microwave power, Frequency and Impedance.

Microwave Communication – Advantages – Analog and digital microwave – FM microwave radio system, Repeaters, Diversity reception, Protection Switching arrangements, FM microwave radio stations, Path characteristics, System gain.

Text Books:

1. Samuel Y. Liao: *Microwave Devices and Circuits,* 3 ed., Pearson Education, 2003.
2. Wayne Tomasi: *Advanced Electronic Communication Systems,* PHI, (Chap. 7), 5th Ed, Pearson Education, 2001

References:

1. K.C. Gupta: *Microwaves*, New Age International.
2. Robert E. Collin: *Foundation of Microwave Engineering,* Mc. Graw Hill.
3. David M Pozar: *Microwave Engineering,* 2nd Edn., John Wiley & Sons (Asia) Pvt. Ltd.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.704 CONTROL SYSTEMS (T) 2-1-0

Module I (Quantitative approach)

History – Components of a control system – Examples of control system application - Open loop and closed loop control systems - Modelling in frequency domain - Mechanical and electromechanical systems. Modelling in time domain: State – space representation – Converting transfer function to state space and state space to transfer function. Design process of control system – Signal flow graphs - Mason's rule formula. Standard test signals, natural frequency and damping ratio, time response specifications.

Module II (Quantitative approach)

Time response of first and second order systems - Steady state and dynamic error coefficients - Routh's stability criterion - Root locus techniques. Frequency response techniques: Nyquist criterion – Stability with the Nyquist diagram – gain margin and phase margin - stability with Bode plots – Steady state error characteristics from frequency response

Module III (Quantitative approach)

Design specification – controller configuration – fundamental principle of design – design with PD, PI, PID, Phase – Lead, Phase – Lag and Lead – Lag controllers.

Design of discrete data control systems – digital implementation of PID, Lead and Lag controllers. Physical realization of digital controllers.

Text Book :

Benjamin C. Kuo: *Automatic Control Systems*, 7th Edn. Prentice Hall of India, New Delhi

References:

1. Norman S Nise: *Control System Engineering,* Addison Wesley
2. K Ogata: *Modern Control Engineering*, Prentice Hall of India, New Delhi, 4th ed., Pearson Education, 2002.
3. Richard C Dorf and Robert H Bishop: *Modern Control Systems,* 9th ed., Pearson Education, 2001.
4. Dean Fredrick & Joe Chow: *Feedback Control Problems using MATLAB,* Addison Wesley.
5. Graham C. Goodwin, *Control System Design*, Pearson Education, 2001.
6. Bandyopadya, *Control Engineering*, PHI

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

Assignment for Sessional marks may be problems based on MATLAB / any other software packages covering the syllabus above.

03.705 (1) (Elective III) IMAGE PROCESSING (TA) 3-1-0

Module I (Quantitative Approach)

Introduction to Digital Image Processing. Introduction to two dimensional sequences, convolution correlation, separability etc. 2D -Fourier and Z - transform and it's properties. 2D DFT and it's properties. Convolution of two dimensional sequences .convolutional filtering. Basics of 2D transform coding, 2D DCT, DST, Walsh Transform. RGB and HSV color model. contrast, brightness, match-band effect etc. Image formation model - Perspective projection. Equation (derivation). Stereoscopic imaging - Depth extraction and Stereoscopic display. Two dimensional sampling theorem, aliasing and reconstruction with problems. Practical limitations in sampling and reconstruction. Moire effect and flat field response.

Module II (Quantitative Approach)

Histogram of an image. Computation of histogram. Image Enhancement operations. Point operations - Histogram equalization, Histogram specification, Contrast stretching, window slicing, bit extraction, change detection, gray scale reversal etc. Median filtering, Spatial low pass high pass and band pass operations. Enhancement using transform domain operations. Root filtering and homomorphic filtering. Edge detection techniques – sobel, robert etc. Edge enhancement techniques. False colouring using sinusoidal transfer function and digital filtering approach. Geometric transforms, Digital Image morphing and warping.

Module III (Quantitative Approach)

Image restoration, system identification, DTF from degraded image spectrum, noise modelling. Wiener filtering - Derivation of filter transfer function - Pseudo and inverse psuedo filtering. Image segmentation by thresholding, Optimal threshold selection – Interactive thresholding and using two peales of histogram. Image segmentation using region growing, region merging and watershed. Image compression - lossy and non lossy compression. Introduction to JPEG and JPEG 2000.

Text books:

1. B. Chandra and D. Dutta Majumdar: *Digital Image Processing and Analysis*, PHI, Eastern Economy Edition.
2. Rafael C Gonzalez, Richard E Woods: *Digital Image Processing*, 2/e, Pearson Education.
3. Anil K Jain: *Fundamentals of Image Processing*, PHI, 1999.

References:

1. Kenneth R Castleman: *Digital Image Processing*, 2/e, Prentice Hall / Pearson Education.
2. Oppenheim & Schafer: *Discrete Time Signal Processing*, 2/e, Prentice Hall of India / Pearson Education.
3. J.R. Parker: *Algorithms for Image Processing and Computer Vision*, Wiley Computer Publications, 1997.
4. M A. Sid Ahmed: *Image Processing*, Mc Graw Hill Publications Inc., 1995.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

Assignment for Sessional marks shall be problems based on Matlab / any other software packages covering the syllabus above.

03.705 (2) (Elective III) SPEECH PROCESSING (TA) 3-1-0

Module I (Quantitative Approach)

Production and Classification of Speech Sounds. Anatomy and Physiology of Speech Production. Spectrographic Analysis of Speech. Categorization of Speech Sounds. Speech Perception. Acoustics of Speech Production. Physics of Sound. Uniform Tube Model. A Discrete-Time Model Based on Tube Concatenation. Vocal Fold/Vocal Tract Interaction. Analysis and Synthesis of Pole-Zero Speech Models. Time-Dependent Processing. All-Pole Modeling of Deterministic Signals. Linear Prediction Analysis of Stochastic Speech Sounds. Criterion of "Goodness". Synthesis Based on All-Pole Modeling. Pole-Zero Estimation. Decomposition of the Glottal Flow Derivative.

Module II (Quantitative Approach)

Homomorphic Signal Processing. Homomorphic Systems for Convolution. Complex Cepstrum of Speech-Like Sequences. Spectral Root Homomorphic Filtering. Short-Time Homomorphic Analysis of Periodic Sequences. Short-Time Speech Analysis. Analysis/Synthesis Structures. Short-Time Fourier Transform Analysis and Synthesis. Short-Time Analysis. Short-Time Synthesis. Short-Time Fourier Transform Magnitude. Signal Estimation from the Modified STFT or STFTM. Time-Scale Modification and Enhancement of Speech. Filter-Bank Analysis/Synthesis. Phase Vocoder. Phase Coherence in the Phase Vocoder. Constant-Q Analysis/Synthesis. Auditory Modeling.

Module III (Quantitative Approach)

Frequency-Domain Pitch Estimation. A Correlation-Based Pitch Estimator. Pitch Estimation Based on a Comb Filter. Speech Coding. Statistical Models of Speech. Scaler Quantization. Vector Quantization (VQ). Frequency-Domain Coding. Model-Based Coding. LPC Residual Coding. Speech Enhancement. Wiener Filtering. Model-Based Processing. Enhancement Based on Auditory Masking. Speaker Recognition. Introduction. Spectral Features for Speaker Recognition. Speaker Recognition Algorithms. Non-Spectral Features in Speaker Recognition.

References:

1. Thomas F. Quatieri: *Discrete Time Speech Signal Processing: Principles and Practice*, Pearson Education Asia.
2. L R Rabiner, R W Schafer: *Digital Processing of Speech Signals*, Prentice Hall Signal Processing Series, 1978.
3. J R Deller Jr, et al: *Discrete-Time Processing of Speech Signals*, IEEE Press, 2000.
4. Ben Gold, Nelson Morgan: *Speech and Audio Signal Processing*.
5. Douglas O'Shaughnessy, *Speech Communication : Human and Machine*, Universities Press, 2000.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

Assignment for Sessional marks shall be problems based on MATLAB / any other software packages covering the syllabus above.

03.705 (3) (ELECTIVE III) PATTERN RECOGNITION (TA) 3-1-0

Module I (Quantitative Approach)

Introduction to pattern recognition, Pattern Recognition Methods, Pattern Recognition System Design, Statistical pattern recognition – Classification, Principle, Classifier learning, Neural networks for pattern classification. Basics of Image Processing - Sampling, 2 dimensional transforms, Image Enhancement, Smoothening, Sharpening, Edge detection, Image Segmentation, Boundary extraction.

Module II (Quantitative Approach)

Introduction to Shape Analysis, Shape Representation, Irregular Shape Representation, Shape Representation in Image Processing , Shape Representation by Convex Hull , SPCH Algorithm for Convex Hull Finding, Stair-Climbing Method for Simple Polygon Finding , Properties of the Simple Polygon, Sklansky's Algorithm for Convex Hull Finding, Convex Hull Based Shape Representation, Boundary and Convex Hull, Description Function, Feature Extraction and Shape Classification, Measurements, Feature Extraction, Shape Classification, Examples of Shape Analysis, Fractals, Self-similarity, Fractal Dimension, Multi-fractals, Fractals Based Shape Representation, Boundary and Fractal Dimension, Region and Fractal Dimension. Introduction to Roundness / Sharpness Analysis, The Problem of Roundness Analysis, The Problem of Circle and Arc Detection, Hough Transform, Definition of Hough Transform, Algorithm of Hough Transform, Circular Hough Transform, Algorithms for Circular Hough Transform Curve Detection, Basic Method, Directional Gradient Method, Centre Method, Gradient Centre Method, Radius Method, Threshold Function , Sharp Corners, Examples of Roundness/Sharpness Analysis.

Module III (Quantitative Approach)

Introduction to Orientation Analysis, Problem of Orientation Analysis , Development of Orientation Analysis, Directed Vein Method, Directed Vein Image, Orientation of a Vein, Algorithm , Convex Hull Method, Principal Component Transformation, Theory of Principal Component Transformation, Orientation by Principal Component Transformation, Theory of Moments, Central Moments, Orientation by Moments, Examples of Orientation Analysis, Introduction to Arrangement Analysis, Aggregates, Examples of Arrangements, Extended Hough Transform, Hough Transform, Extension of Hough Transform, Simplified Extended Hough Transform, Arrangement Features, Orientation and Position, Description in Hough Space, Feature Extraction, More Arrangements ,Measurements ,More Features Description and classification of Arrangements.

References:

1. Daisheng Luo, *Pattern recognition and image processing* – Horwood publishing , England
2. Milam Sonka, Vaclav HLAVAC, Roger Boyle, *Image Processing, Analysis and Machine Vision* , 2/e, Thomson Learning.
3. Jr. Parker – *Algorithms for Image Processing and Computer Vision* , John Wiley.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

Assignment for Sessional marks shall be problems based on MATLAB / any other software packages covering the syllabus above.

03.705 (4) (ELECTIVE III) QUANTUM COMPUTING (TA) 3-1-0

Module I (Quantitative Approach)

Foundations of quantum theory. States, Observable, Measurement and unitary evolution. Spin-half systems and photon polarizations, qubits versus classical bits. Pure and mixed states, density matrices. Extension to positive operator valued measures and superoperators. Decoherence and master equation. Quantum entanglement and Bell's theorems.

Module II (Quantitative Approach)

Introduction to classical information theory and generalization to quantum information. Dense coding, teleportation and quantum cryptography. Turing machines and computational complexity. Reversible computation.

Module III (Quantitative Approach)

Universal quantum logic gates and circuits. Quantum algorithms: database search, FFT and prime factorization. Quantum error correction and fault tolerant computation. Physical implementations of quantum computers.

Text Books:

1. Berman G.P., Dooten G.D., Mainieri. R. & Tsifrinovich V., *Introduction to Quantum Computers*, World Scientific.
2. Lo H.K., Popescu S. & Spiller T., *Introduction to Quantum Computation and Information*, World Scientific.
3. Press A., *Quantum Theory: Concepts and Methods*, Kluwer Academic

Reference:

1. Preskill J., *Lecture Notes for the Course on Quantum Computation*
2. Neil Gershenfeld: *The Physics of Information Technology* – Cambridge University Press, 2000

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.705 (5) (ELECTIVE III) ANTENNA THEORY AND DESIGN (T) 3-1-0

Module I

Cylindrical antenna – Current distributions, Input impedance, Patterns. Thin cylindrical antenna, Antennas of other shapes – Current distribution on long cylindrical antennas. The moment method in Electrostatics. The moment method and its application to a wire antenna.

Continuous aperture distribution, Fourier transform relations between the far – field pattern and the aperture distribution. Spatial frequency response and pattern smoothing. Aperture synthesis – Multi aperture arrays, Grating lobes.

Module II

Lens antenna – Fermat's principle. Artificial dielectric lens antennas. E-plane and H-plane metal-plate Lens antennas, Electrically Small antennas, Physically Small antennas – Antenna siting, Ground plane antennas, Sleeve antennas, Turnstile antennas, Super turnstile antennas, Omnidirectional antennas – circularly polarized antennas, Antenna design considerations for satellite communication – Receiving, Transmitting and Bandwidth consideration. ILS antennas.

Module III

Antennas for terrestrial mobile communication. Antennas for ground penetrating radar, UWB antennas for digital applications.

Terahertz antennas – Pyramidal horn cavity with dipole. Planar antenna structure in dielectric lenses, Smart antennas.

Microstrip antennas – Rectangular patch – Models directivity, Circular patch – Design, Conductance and directivity, Quality factor, Bandwidth, efficiency, Input impedance, Coupling.

References:

1. John D. Krans, Ronald J. Marhefka: *Antennas for all Applications*, 3/e, TMH.
2. Constantive A. Balanis: *Antenna Theory – Analysis and Design,* 2/e, John Wiley & Sons.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.706 (1) (Elective- IV) ADVANCED MICROPROCESSOR ARCHITECTURE AND PROGRAMMING (TA) 3-1-0

Module I:

History of Intel Pentium 4 Processor Architecture, performance and Moores's Law, Floating-point unit, Detailed description of Pentium Processor Net Burst Micro architecture, Hyper Threading, Basic Execution Environment-Modes of operation, overview, Execution trace Cache, MESI protocol, Real and Protected mode Memory organization, Registers, Operand size address size, procedure calls, Interrupts and exception. Overview of IA 64 architecture.

Module II:

Data type & Address modes-Fundamental data type, numeric, pointer, string data type, floating point, SMD Techniques, MMX data type, operand addressing, I/O port addressing, instruction set, MMX and SSE instructions, floating point instructions, system instruction, string operations, segment register instruction.

Module III:

Introduction to assembly language programming, simple arithmetic programming, floating point programming, MMX Programming, Interrupt programming, Advanced I/O Programming, Exception handling, Real Mode and Protected Mode programming, communication programming.

Text Books:

1. Intel Architecture Software Developer's Manual-Volume 1, Basic Architecture.
2. Peter Able: *IBM Assembly Language & Programming*, PHI, 2003.
3. Intel Architecture Software Developers Manual-Vol-3, System Programming Guide

References:

1. Intel Architecture Software Developers Manual-Volume-2, Instruction Set reference.
2. Randall Hyde, *The Art of Assembly Language Programming*.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.706 (2) (Elective IV) OPTOELECTRONIC DEVICES (TA) 3-1-0

Module I

Optical Waves: Maxwell's equations, dielectric function, absorption coefficient and index of refraction, boundary conditions, plane waves, plane waves at interfaces, multilayer structures, Helmholtz wave equations, symmetric planar waveguides, rectangular waveguides, waveguide modes, periodic structures, Guassian beams, far field, photon generation, optical gain and spontaneous emission, heat generation and dissipation, thermal resistance, boundary conditions

Module II

Edge emitting lasers, models and material parameters, cavity length effects on loss parameters, slope efficiency limitations, thermal effects on laser performance, vertical cavity laser, model and parameters, carrier transport effects, thermal analysis, temperature effects on optical gain, nitride light emitters, material properties, InGaN/GaN LEDs, InGaN/GaN lasers, electroabsorption modulator, amplification photodetector, device structure and material properties

Module III

Planar optical devices, fabrication of planar optical devices, integrated optical circuits, splitters and couplers, isolators, circulators, polarization control, lenses and prisms, diffraction gratings, planar diffraction gratings and in fiber bragg gratings, waveguide grating routers, filters, modulators and switches

Textbooks:

1. J. Piprek, *Semiconductor Optoelectronic Devices: Introduction to physics and simulation*, Academic Press 2003
2. J.R. Dutton, *Understanding optical communications*, Prentice Hall 1999

References :

1. P Battacharya – *Semiconductor Optoelectronic Devices* – 2/e – Pearson Education - 2001
2. S. Desmond Smith *Optoelectronic Devices*-, Prentice Hall (UK), London
3. Wilson Hawkes, *Optoelectronics – An Introduction* - PHI New Delhi.
4. Pallab Bhatta Charya *:Semiconductor Optoelectronic Devices*- Pearson Education New Delhi.
5. Culshaw, *Optical Fiber Sensor* - Artech House, Norwood

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.706 (3) (ELECTIVE IV) SYSTEM SOFTWARE (TA) 3-1-0

Module I

Simplified Instruction Computer. Assembler- Basic Functions, Machine dependent Assembler features, Machine Independent Assembler Features, One-pass Assembler, Multi-pass Assembler, MASM Assembler. Loaders and Linkers - Basic Loader functions, Machine Dependent Loader Features. Machine Independent Loader Features, Loader design Options, MS-DOS Linker. Macro Processors -Basic functions, Machine Independent Macro processor Features, Macro processor design options, MASM macro processor, ANSI C Macro Language, Basic Blocks of Compiler.

Module II

Introduction to unix, shells, environment variables, files and directories, user and group permissions, kernel and system calls, shell programming, kernel and user process, context switching, process memory, shared libraries and linking, a.out and ELF file structure. Creation of Process, Process ID, parent process ID, Process Group ID, real and effective group ID, process resource limits. Signaling the process, command line values, usage of fork, execlp, execvp system calls, errormessages. Inter process communication (IPC) using - Lock files, pipes, message queues and semaphores. Shared memories, using file as a shared memory, remote procedure calls(RPC), RPC Execution, RPC Broadcast, Debugging RPC applications.

Module III

Sockets: Addressing, Protocol families, types, IPC using socket pair, Sockets for connection oriented communication (Streaming) and connectionless communication (datagrams). unix domain and internet domain sockets. multiplexing I/O with sockets. Threads :basic concepts, creation and exiting, thread management, scheduling. signals in threads. thread synchronization, thread specific data. debugging multithreaded programs. Software Engineering: Concepts, System specification, Procedural system design, Object oriented design and analysis. Iterative development and unified process. Introduction to Unified Modeling Language and UML Diagrams. System testing strategies.

Text books :

1. Leland L Beck,*System Software : An Introduction to System Programming* ,3rd edition, Pearson
2. John Shapley Gray,*Interprocess Communication in Unix, the nooks and crannies* ,2nd Edition, PHI
3. Martin Fowler,UML Distilled:*A Brief Guide to the Standard Object Modeling Language* ,Third Edition AW

References:

1. WR Stevens,*Advanced Programming in theUunix Environment* ,AW
2. R Stevens,*Unix Network Programming Vol 1 & Vol 2* ,PHI
3. R Stevens,*TCP/IP Illustrated* ,Volume 2,AW
4. Larman C,*Applying UML & Patterns: An Introduction to Object - Oriented Analysis & Design* , Addison Wesley,

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.706 (4) (ELECTIVE IV) DISCRETE EVENT SYSTEM SIMULATION (TA) 3-1-0

Module I (Quantitative Approach)

Introduction to simulation. Motivational examples. Discrete Event Models. Modeling of Uncertainty. Random Number generation and Random Variate Generation. Test of Random number sequences and goodness of fit tests. Simulation languages. GPSS, SIMSCRIPT.

Module II (Quantitative Approach)

Statistical models. Continuous and discrete distributions. Poison process. Empirical distributions. Queuing models – characteristics – long-run performance- steady state behavior infinite population markov models. Steady state behavior of finite population models.

Module III (Quantitative Approach)

Selection of Input Probability distribution. Multivariate and time-series input models. Verification of Simulation models. Validation of Simulation models. Variance reduction and output analysis.

Text Book:

1) Banks J, Carson J S and Nelson B – Discrete-Event System Simulation, 3/e, Pearson

Reference:

1) Law AW ,Kelton WD ,*Simulation Modeling and Analysis* ,McGraw Hill, 1991
2) Raj Jain,*The Art of Computer System Performance Analysis* ,Wiley and Sons, 1991
3) Trivedi KS,*Probability and statistics with reliability, Queuing and Computer Science Applications* , PHI, 1990

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

Assignment for Sessional marks shall be problems based on MATLAB / any other software packages covering the syllabus above.

03.706 (5) (Elective IV) MICROWAVE SOLID STATE DEVICES AND CIRCUITS (T) 3-1-0

Module I

Microwave Network Analysis – Equivalent voltages and currents, Impedance, Impedance and Admittance matrices, Scattering matrix, The transmission matrix. Signal flow graphs. Impedance matching and tuning – Matching with lumped elements, Single stub tuning, Double stub tuning. Quarter wave transformer, Theory of small reflections: Bipolar transistors – biasing, FET – biasing, MESFET – Structure, Operation, High Electron mobility transistors (HEMT) – Physical structure, Operation, Characteristics.

Module II

Gunn – effect diodes – Gunn effect, Ridley – Watkins-Hilsum theory, Modes of operation, Limited space – Charge accumulation (LSA) mode of gunn diode, InP diodes. Microwave generation and amplification.

The Read diode, IMPATT diodes – Structure, Operation, Power output and efficiency, TRAPATT diodes – Operation, Power output and efficiency BARITT diodes – structure, Operation. Parametric devices, Parametric amplifiers. Monolithic Microwave Integrated Circuit – Materials, Growth, MOSFET fabrication.

Module III

Microwave filters – Periodic structures – Analysis of infinite periodic structures and terminated periodic structures, Filter design by image parameter method – Constant k, m-derived and composite. Filter design by insertion loss method. Filter transformation and implementation.

Microwave amplifiers and oscillators – Amplifiers – Gain and stability, Single stage transistor amplifier design. Oscillator design – One port negative resistance oscillators, transistor oscillators.

References:

1. David M. Pozar : *Microwave Engineering* , 2nd edn., John Wiley & Sons (Asia) Pvt. Ltd.
2. Sitesh Kumar Roy, Monojit Mitra : *Microwave Semiconductor Devices,* PHI - 2003.
3. Liao: *Microwave Devices and Circuits* , 3rd edn, Pearson Education, 2003.
4. Robert E Collin: *Foundations of Microwave Engineering,* Mc Graw Hill.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.707 MICROPROCESSOR LAB (TA) 0-0-2

1) Study of 8086 kits

-To study hardware details, how to use kits (enter, edit and execute a program) giving importance to user RAM area, IN/OUT ports, interfacing details.

2) Assembly language programs

1. Addition / Subtraction of 64 bit Nos.
2. Average of N numbers
3. 32 bit multiplication
4. 32 bit division
5. Square root of 32 bit no.
6. LCM and HCF
7. Bubble sorting
8. Prime number generation
9. Average of even and odd numbers from a data block
10. Fibanocci series
11. Conversion between number systems (ASCII, HEX, BINARY, BCD, DECIMAL)

-To study the algorithm, handling, program entry and execution.

3) Interfacing

1. Elevator Simulator
2. EPROM Programmer

3. Data acquisition
4. Hardware single stepping
5. Video display
6. Moving graphic display
7. Keyboard interface
8. Stepper motor
9. Waveform Generator

4) Simulation of programs (Sl no 2) using TASM.

Note

For University examination, the following guidelines should be followed regarding award of marks

(a) Flow chart -25%
(b) Program & Results -50%
(c) Viva voce -25%

Practical examination to be conducted covering entire syllabus given above.

03.708 DIGITAL SIGNAL PROCESSING LAB (T) 0-0-2

The following experiments may be done using

a) DSP kits – Assembly /C language programming.
b) MATLAB

1. Generation of various signals.
2. Generation of AM, FM & PWM waveforms.
3. Implementation of Linear convolution, Circular convolution, Linear convolution using circular convolution.
4. DFT Implementation.
5. Design & implementation of IIR filters.
6. Design & implementation of FIR filters.
7. Real time filtering of signals.
8. Spectral analysis of Biomedical & Audio frequency signals.

Note

For University examination, the following guidelines should be followed regarding award of marks

(a) Design /Concept -25%
(b) Program & Results -50%
(c) Viva voce -25%

Practical examination to be conducted covering entire syllabus given above.

03.709 PROJECT DESIGN AND SEMINAR (TA) 0-0-3

a) Project design (75 marks) – Internal Evaluation

The student is expected to select and complete the design of the project work and submit the design phase report and presentation. The design phase report shall be submitted for evaluation. This shall be in soft binded form. This is the first volume of the Project report. The Second volume is the final project report in the eighth semester. (25 marks for evaluation of design report, 25 marks for presentation and 25 marks for viva).

The no. of students in a project batch shall be limited to a maximum of five.

b) Seminar (25 marks) – Internal Evaluation

The student is expected to present a seminar in one of the current topics in Electronics, Communication, Electronic Instrumentation and related areas.

The student will undertake a detailed study on the chosen subject and submit a seminar report at the end of the semester. (Presentation 15 marks, Report 10 marks)

03.801 OPTICAL COMMUNICATION (T) 2-1-0

Module I

Optical transmission system concepts, optical networking, Optical interconnects, Optical computers, transmitting light on a fiber, light propagation in multimode fibers single mode fiber properties and characteristics, plastic optical fiber, HPCF, technology of fiber manufacture, joining fibers, fiber cables

Optical sources and detectors: light production, LEDs, characteristics, lasers, DFB lasers, tunable DBR lasers, photoconductors, photodiodes, and phototransistors
Optical devices: EDFAs, II generation EDFAs, Pr and Nd doped fiber amplifiers, plastic fiber amplifiers, erbium doped planar devices, SOAs/SLAs, Raman effect amplifiers

Module II

Optical Communication System, point to point transmission systems, modulation, transmission system limits and characteristics, optical systems engineering, control of dispersion in SM and MM fiber links, fiber optics in different environments, test equipment and techniques. Solitons, dark solitons and spatial solitons

Module III

Optical link connections in electronic networks: FDDI, Ethernet, fiber channel, ESCON and intersystem coupling, Opticonnect, SONET and SDH, ATM, WDM, building photonic networks, components for WDM, add drop multiplexers, optical space division switches, optical switching nodes, wavelength converters, standards for WDM, lightwave networks

Textbooks:

1. J.R. Dutton: *Understanding Optical Communications*, Prentice Hall 1999
2. G. Keiser: *Optical Fiber Communications*, 3/e, MGH 2000

References:

1. D K Myabaev & L L Scheiner: *Fiber Optics Communications Technology* – Pearson Education - 2001
2. John M Senior: *Optical Fiber Communications* – 2/e, PHI - 1992
3. G P. Agrawal: *Fiber Optic Communication*, John Wiley & Sons.
4. M Bass: *Fiber Optic Hand Book*, McGraw Hill 2002.
5. JH Franz & V K Jain: *Optical Communication*, Narosa Publishing House, 2001.
6. M M Rao, *Optical Communication*, Universities Press Limited, 2000.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.802 RADAR & TELEVISION ENGINEERING (T) 2-1-0

Module I

Radar – Principles – The Radar equation. Principles, operation and applications of CW and FM Radar, MTI and pulse Doppler Radar and Tracking Radar. Radar modulators. Radar receivers, Displays and duplexers.

Module II

Principles of Television – scanning, blanking and synchronisation, picture signal - composite video signal, Type of modulation and channel bandwidth. CCD Camera.
Monochrome TV receivers - RF tuner, choice of IF, IF amplifiers, detectors, video section, sound section, Keyed AGC, sync separation, horizontal and vertical deflection circuits, EHT generation, monochrome picture tube.

Module III

Basic principles of Colour TV - colour theory, Colour TV systems - NTSC, PAL & SECAM (block schematic description), colour TV picture tubes – delta gun, PIL, Trinitron.
Cable TV and systems – traditional cable TV networks – Two way Access networks and Technologies – Digital Video and Audio signals – MPEG standards, Cable TV Frequency plans – coaxial cable TV components and systems – RF digital QAM modems, Subscriber Home terminals - digital set-top box – Out of band receiver, MPEG Video / Audio demultiplexer and decoder – conditional access and control.

Text Books :

1. Merrill I. Skolnik: *Introduction to Radar Systems*, 2nd ed., Tata McGraw Hill, New Delhi.
2. R R. Gulati: *Monochrome and Colour Television*, Wiley Eastern Ltd.
3. Shlomo Ovadia: *Broadband Cable TV Access Networks*, PH-PTR, 2001.

References :

1. A M Dhake: *Television and Video Engineering*, 2nd ed., Tata McGraw Hill, New Delhi.
2. Merrill I. Skolnik: *Radar Hand Book*, 2nd ed., McGraw Hill.
3. Grob & Herndon: *Basic Television and Video Systems*, 6th Edn., McGraw Hill.
4. Byron Edde: *Radar Principles, Technology & Applications*, Pearson Education.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.803 COMPUTER COMMUNICATION (T) 2-1-0

Module I

Network Architecture, Packet and Circuit switching, Layering and Protocols, OSI Layering, TCP/IP Layering, Performance Issues. Data link Layer: Framing, Frame length design, Error Detection, Internet Checksum, Cyclic Redundancy Check; Reliable Transmission, Stop and wait protocol, sliding window protocols. Analysis of stop and wait, sliding window protocols. Ethernet, MAC Layer design, CSMA/CD. Logical Link Control. Wireless LAN (IEEE 802.11), CSMA/CA. Delay models in data networks, Queuing models, Littles theorem - Markov chains, Poison process. Analysis of M/M/1, M/M/m, M/M/infinity, M/M/m/m -queuing models,. Protocol stack design and Socket Programming

Module II

Network Layer: Network as graph. Routing Algorithms - Shortest path Routing, Distance vector Routing, Link State Routing, Hierarchical Routing. Multiprotocol Label Switching (MPLS). Internet Working: Simple IP, Addressing, Packet Forwarding, Address Translation, Address Resolution Protocols (ARP), Error Reply (ICMP), Global Internet, Subnetting, Routing in the internet - Intra Autonomous system routing (OSPF), Routing Information protocol, Inter Autonomous System Routing (BGP), Classless Routing (CIDR). IP Version 6, Multicasting, UDP, TCP, Congestion Control, TCP Congestion Control, TCP Congestion Avoidance, TCP Flow Control, Quality of Service, RSVP, RTP, Voice over IP. DNS working. SNMP.

Module III

Network Security Issues, Multilevel Security models. Authentication Protocols, Message Integrity Protocols, Message Digest 5 (MD5), Access control: Firewalls and Packet filtering. Types of Attacks, Network Intrusion Detection System. Security in Layers - Application Layer: SSH, PGP. Transport Layer: TLS, SSL. Network Layer: IP Security (IPSec). Virtual Private Networks.

Text Books :

1. Larry Peterson and Bruce S Davie: *Computer Network- A System Approach* :, 3rd Edition, Morgan Kaufmann.
2. D Bertsekas and R Gallager: *Data Networks,* 2nd Ed, PHI.

References:

1. JF Kurose: *Computer Network A Topdown Approach Featuring the Internet* , Pearson, 2nd Edition.
2. S. Keshav : *An Engineering Approach to Computer Networking,* Pearson Education Asia.
3. Charlie Kaufman et al : *Network Security Private Communication In A Public World* , Pearson, 2nd Edition.
4. Naganand Doraswamy, Dan Harkins : *IPSec The New Security Standard for the Internet, Intranets and Virtual Private Networks* – Prentice Hall PTR.
5. R. Stevens : *TCP/IP Illustrated Volume I* – Addison Wesly
6. R. Stevens : *TCP/IP Illustrated Volume II* – Addison Wesly

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.804 SATELLITE & MOBILE COMMUNICATION (T) 2-1-0

Module I

Kepler's law – Satellite orbits – Geostationary satellites – Antenna look angles – Satellite classification – Spacing and frequency allocation – Satellite antenna radiation patterns – Satellite system parameters – Satellite system link models – Link equations – Link Budget. Satellite Multiple – Access System – FDM/FM Satellite systems – Multiple accessing – Channel capacity – Satellite radio navigation.

Module II

Introduction to modern wireless communication systems: Second generation cellular networks – Third generation wireless networks – wireless LANs – Personal area networks.

The cellular concept – frequency reuse - Handoff strategies – Interference and system capacity - Improving coverage and capacity in cellular systems.

Mobile Radio Propagation – Practical link budget design using path loss models – outdoor and indoor propagation models – Fading and Multipath channels and their parameters.

Module III

Multiple Access Techniques for wireless communications – FDMA, TDMA, SSMA, SDMA. Packet radio. Codes for Mobile Communication.

Wireless systems and standards – GSM – CDMA digital (IS-95) – Cordless systems – Wireless Local Loop – Mobile IP 386 – Wireless Application Protocol. Bluetooth – Overview – Radio, base band and Link Manager specifications – Logical link control and adaptation Protocol.

Text Books:

1. Wayne Tomasi: *Advanced Electronics Communication Systems* –PHI, 4TH Edn. (Chap. 8th & 9th) 5th Ed, Pearson Education, 2001.
2. Theodore S. Rappaport: *Wireless Communication Principles and Practice*, PHI, 2nd edn., Pearson Education, 2002.
3. William Stallings: *Wireless Communications and Networks*, 2002, Pearson Education Asia.

References :

1. Dennis Roody, *Satellite Communication*, 2nd edn. Mc Graw Hill.
2. Pritchard Suyderhoud, Nelson: *Satellite Communication Systems Engineering*, 2nd edn., Pearson Education.
3. William C Y Lee: *Mobile Cellular Telecommunications*, 2 edn. Mc. Graw Hill.
4. Madhavendr Richharia: *Mobile Satellite Communications : Principles and Trends*, Pearson Education, 2003.
5. Schiller: *Mobile Communications*, Pearson Education, 2000.
6. Garg: *Wireless Network Evolution – 2G to 3G*, PH-PTR, 2002
7. Dharma Prakash Agarwal: *Introduction to Wireless & Mobile Systems*, Vikas Publishers.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.805 (1) (Elective V) MULTIRATE SYSTEMS & WAVELETS (TA) 3-1-0

Module I (Quantitative Approach)

Review of Multirate Signal Processing. Maximally decimated filter banks – QMF banks – M-channel filter Banks – polyphase representation – PR Systems - Alias-free filter banks – Structures – Trans-multiplexers. Para unitary PR filter banks – Properties – QMF banks and structures – Transform coding and the LOT. Linear phase PR QMF banks and structures. Cosine modulated filter Banks and its structures. Sub band and orthogonal transform coder.

Module II (Quantitative Approach)

Brief review of Linear algebra and vector spaces – Vector spaces – Subspace – Linear transformations – Orthogonal projection – Hilber space - $L^2(R)$ space. Continuous wavelet Transform. Discrete wavelet Transform – Introduction – Nested Linear vector sub spaces – Definition of an MRA – Example – construction – A wavelet basis for the MRA – Digital filtering Interpretation – Examples – Interpreting orthogonal MRAs for discrete time signals. Biorthogonal wavelet bases and examples. Two dimensional wavelets and examples.

Module III (Quantitative Approach)

Wavelet Transform Applications – Data compression – Transform Coding – DTWT for Image compression – Audio compression – Video coding – Wavelet de noising – Speckle removal – Edge detection – Image fusion – Object detection – Scaling functions – Multi tone modulation. CWT and DWT – Operations and algorithms – Regularity and convergence – Daubechies construction – Band limited bi-orthogonal decomposition – Design and selection of wavelets – Reconstruction circular convolution filter banks – interpolators matched to the input process.

References :

1. P.P. Vaidyanathan: *Multirate Systems & Filter Banks*, PTR, PH, 1993
2. Gilbert Strong: *Linear Algebra and its Applications*.
3. Reghuveer M Rao, Ajit S Bopardikar: *Wavelet Transforms – Introduction to Theory and Applications*, Pearson Education Asia, 1998.
4. Strang G S, T Q Nguyen: *Wavelets and Filter Banks*, Wellesley – Cambridge Press 1996.
5. Burrus C S, R A Gopinath and H. Gao: *Introduction to Wavelets and Wavelet Transforms: A Primer*, Prentice Hall, 1998.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

Assignment for Sessional marks shall be problems based on MATLAB / any other software packages covering the syllabus above.

03.805 (2) (Elective V) INTEGRATED OPTICS & PHOTONIC SYSTEMS (TA) 3-1-0

Module I

Integrated photonics: history and characteristics, integrated photonics technology, basic Integrated photonics components, IP devices, electromagnetic waves, Maxwell's equations, wave equation in dielectric media, monochromatic waves in dielectric media, polarization of EM waves, light propagation in absorbing media, EM waves at planar dielectric interface, boundary conditions at the interface, reflection and transmission coefficients, total internal reflection.

Module II

Integrated optic waveguides, optical waveguides, modes in planar waveguides, wave equation in planar waveguides, guided modes in step index planar waveguide and channel waveguides, Marcatili's method and effective index method, graded index planar waveguides, multilayer and ray approximations, reconstruction of index profiles, inverse WKB method, modal coupling, coupled mode equations, co directional and contra directional coupling, diffraction gratings in waveguides, coupling coefficients in modulation index and relief diffraction gratings

Module III

Light propagation in wave guides: beam propagation method, paraxial propagation method, fresnel equation, Fast Fourier transform method based on finite differences, boundary conditions, transparent boundary conditions, spatial frequencies filtering, modal description based on BPM, modal field calculation using BPM

Textbooks:

1. G. Lifante - *Integrated Photonics: Fundamentals* - John Wiley & Sons 2003
2. P Battacharya - *Semiconductor Optoelectronic Devices* – 2/e– Pearson Education - 2001

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03. 805 (3) (Elective V) SOFTWARE ARCHITECTURE & SYSTEMS (TA) 3-1-0

Module I (Quantitative Approach)

Software process and the role of modeling and analysis, Software architecture, and software design. Software Modeling and Analysis : analysis modeling and best practices, Traditional best practice diagrams such as DFDs and ERDs, UML diagrams and UML analysis modeling, Analysis case studies, Analysis tools, Analysis patterns.

Module II (Quantitative Approach)

Software Architecture : Architectural styles, Architectural patterns, Analysis of architectures, Formal descriptions of software architectures. Architectural description lnguages and tools, Scalability and interoperability issues, Web application architectures, Case studies.

Module III (Quantitative Approach)

Software Design: Design best practices, Design patterns, Extreme programming, Design case studies, Component technology, Object oriented frameworks, distributed object request brokers, case studies.

Reference:

1. Booch G, Rumbaugh, J. Jacobson : *The Unified modelling Language User Guide*, Addison-Wesley, 1999
2. Gamma, E. Helm, R. Johnson, R. Vissides : *Design Patterns, Elements of Reusable Object-Oriented Software Architecture, Volume I: A System of Patterns*. John Wiley & Sons, 1996
3. Shaw M, Garlan D : *Software Architecture : Perspectives on an Emerging Discipline*, Prentice Hall, 1996
4. Len Bass et al: *Software Architecture in Practice* – Addison Wesly, 1998.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.805 (4) (Elective V) ARTIFICIAL NEURAL NETWORKS (TA) 3-1-0

Module I (Quantitative Approach)

Introduction – uses of neural networks, Biological neural networks- neuro physiology, models of a neuron-Mc Culloch & Pitts model, Activation functions- types, multiple input neurons.

Learning processes- learning paradigms- supervised and unsupervised learning.

Single layer perceptrons-Architecture-learning rule- Perceptron convergence theorem.

Performance learning-Quadratic functions-performance optimization-steepest descent algorithm, learning rates, Widrow-Hoff learning- ADALINE networks, LMS algorithm, linear separability- The XOR problem, Multilayer Perceptrons (MLPs)- Backpropagation algorithm.

Module II (Quantitative Approach)

RBF networks- Cover's theorem on separability of patterns, comparison of RBF networks and MLPs.

Associative learning- Unsupervised Hebb rule, Instar and outstar rules.

Competitive learning- Winner –Take-All networks, Learning Vector Quantizers, Counter propagation networks, Adaptive Resonance Theory (ART)- ART1 clustering algorithm, ART1 network architecture.

Module III (Quantitative Approach)

Self Organizing Maps (SOM), Principal Component Analysis (PCA) networks.

Hopfield networks – Discrete Hopfield networks- energy function- storage capacity of Hopfield networks, Optimization using Hopfield networks- Travelling salesperson problem, solution of simultaneous linear equations, character retrieval. Boltzmann machines. Simulated Annealing.

References:

1. Martin T. Hagan, Howard B. Demuth & Mark Beale :*Neural Network Design*, Vikas Thomson learning.
2. Simon Haykin : *Neural Networks- A Comprehensive Foundation,* Pearson Education.
3. Kishan Mehrotra, Chilukuri K. Mohan, Sanjay Ranka: *Elements of Artificial Neural Networks,* Penram International Publishing (India).
4. James A Freeman, David M. Skapura:*Neural Networks- Algorithms, Applications and Programming Techniques*, Pearson Education.
5. Bose & Liang :*Neural Network Fundamentals,* Mc Graw Hill.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.805 (5) (Elective V) CDMA SYSTEMS (TA) 3-1-0

Module I (Quantitative Approach)

Introduction to CDMA. Multiple access using spread spectrum. PN Codes. Link analysis- Shadowing, Multipath Rayleigh Fading, Multipath Delay Spread. Principles- Capacity, Power control, Hands off. Link Structure - Asymmetric link - Forward link - Reverse Link. Call Processing - states. CDMA Design Engineering.

Module II (Quantitative Approach)

Direct Sequence and Frequency Hopped Spread Spectrum, Spreading sequences and their correlation functions, Acquisition and tracking of spread spectrum signals, Error probability for DS-CDMA on AWGN channels. DS-CDMA on frequency selective fading channels, Performance analysis of cellular DS-CDMA.

Module III (Quantitative Approach)

Effect of imperfect power control on DS-CDMA performance, Spreading/Coding trade offs. Multi-carrier CDMA, IS-95A CDMA system. Third generation CDMA systems, Multi-user Detection-Optimum receiver, MMSE, Decorrelation, SIC, PIC receivers and performance.

Reference:

1. Samuel C Yang, *CDMA RF System Engineering*, 1998, ARTEC HOUSE Inc,
2. Andrew J Viterbi, *CDMA: Principles of spread spectrum Communication*, Addison Wesley, 1996
3. Sergio Verdu, *Multiuser Detection*, Cambridge University Press, 1998

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.806 (1) (Elective VI) ADAPTIVE SIGNAL PROCESSING (TA) 3-1-0

Module I (Quantitative Approach)

Optimum linear filters – Optimum Signal Estimation – LMS error estimation – solution of the Normal Equations – Optimum FIR filters – Linear Prediction – optimum IIR filters – Inverse filtering and deconvolution – channel equalization in data transmission systems – matched filters and Eigen filters.

Algorithms for optimum Linear filters – order recursive algorithms for optimal FIR filters – Levinson and Levinson Durbin algorithms.

Module II (Quantitative Approach)

Structures for optimum linear filters – Lattice structures – Algorithm of schiir – Triangularization and inversion of Toeplitz Matrices – Kalman Filter algorithm. Least squares filtering and prediction – Principles – Error estimation – LS FIR filters – Linear LS signal estimation – LS computations using Normal equations, orthogonalization techniques and singular value decomposition.

Module III (Quantitative Approach)

Adaptive filters – principles – typical applications – Method of Steepest Descent – LMS adaptive filters - Recursive LS adaptive filters. Array fundamentals – RLS algorithms for Array processing – Spatial filtering – Adaptive spatial filtering – Space time adaptive processing. Performance of adaptive algorithms.

Text Books:

a. Dimitris G. Manolakis, Vinay K Ingle, Stephan M Krgon : *Statistical and Adaptive Signal Processing,* Mc Graw Hill, 2000.

2) Simon Haykin: *Adaptive Filter Theory,* 3rd edn., Prentice Hall International Editions, 1996.

Reference:

Windrow, Steams: *Adaptive Signal Processing* , Pearson Education, 2001

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

Assignment for Sessional marks shall be problems based on MATLAB / any other software packages covering the syllabus above.

03.806 (2) (Elective VI) EMBEDDED SYSTEMS (TA) 3-1-0

Module I (Quantitative Approach)

Introduction to Microprocessors and Embedded RISC processors, Architecture of the MPC 860 processor and Power PC core, Instruction set, Programming model, Exception handling and processing, MMU, Instruction and Data Cache, Memory controller, Communication Processors Module and Serial Interface, Serial Management Controller and Serial Communication Controller.

Module II (Quantitative Approach)

UART, HDLC and Ethernet Protocol, SDMA channels and IDMA emulation, CPM interrupt controller and CPM timers, SPI, I2C and Parallel ports, Reset, Clock, Power control External bus interface, System Development and Debugging. Real Time System concepts, Kernel structure, Task management, Time management, Inter task communication & synchronization, Memory management.

Module III (Quantitative Approach)

8096 processor architecture – High speed registers, Serial output ports, Programmable timers, PW registers. Instruction set, Assembly language programming, Hardware interfacing, Memory. Architecture of 68C11, Instruction set, Programming.

Text Book:

1. Cathy May and Ed Silha, *The Power PC Architecture* , Morgan Kauffman, 1998

References:

1. *16 bit embedded Controller Hand book* - Intel 1990.
2. *The Programming Environment for 32-Bit Microprocessors,* Motorola
3. *MPC860 User's Manual* ,Motorola
4. David L Ripps,*An Implementation guide to Real Time Programming* ,Yourdon Press, 1990

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.806 (3) (Elective VI) MICROCONTROLLER BASED SYSTEM DESIGN (TA) 3-1-0

Module I (Quantitative Approach)

History of microcomputers, Application of embedded controllers, Over view of 8051, 8096, 6811, 6812. 6812 architecture, 68HC12 Hardware system ,Modes of operation ,Hardware pin assignments, 68HC12 sub system.

Module II (Quantitative Approach)

Programming model, Assembly language, instruction execution cycle, Instruction set, Addessing modes, Advanced assembly programming. Interrupts, General interrupts, concept of ISR ,Writing an ISR for 68HC812 ,Advanced interrupt topics.

Module III (Quantitative Approach)

Clock Module – Background theory, clock module, Clock drivider chain, 68HC12 Timer Module, Components of the timer module. The Real Time Interrupt (RTI). Programming Input Capture, Output Compare and the Pulse Accumulator Features of the TIM. 68HC12 memory system, 68HC12 ADC (ATD), 68HC12 Communication System.

References:

1. Daniel J Pack & Steven F Barett –*68HC12 Microcontroller*
2. Han –Way Huang –*MC 68HC12 An Introduction : Software & Hardware*
3. Jonathan W Valvano –*Introduction to Embedded Microcomputer System : Motorola 6811/6812 Simulator.*

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.806 (4) (Elective VI) COMMUNICATION PROTOCOLS (TA) 3-1-0

Module I (Quantitative Approach)

TCP/IP Protocol suite overview. Protocol structure. Error and Flow Control. Protocol Specification and Modeling: Validation Models. Correctness requirements. Protocol design. Finite state machines.

Module II (Quantitative Approach)

Conformance testing, Protocol Synthesis, Protocol Validation, Introduction to Estelle. Implementation and verification of Protocols in Estelle. SDL, Introduction to security Protocols. Security Properties, Encryption modes, Security protocol vulnerabilities

Module III (Quantitative Approach)

The CSP approach, Limits of formal analysis. CSP - building blocks, parallel operators, hiding and renaming, process behavior, discrete time. Modeling security protocols in CSP. Expressing protocol goals. Overview of FDR. Encoding protocols and intruder in FDR. Theorem proving, Simplifying transformations. Case studies.

Text Books:

1. Gerard J Holzmann:*Design and Validation of Computer Protocols* ,Prentice Hall.
2. Peter Ryan,Steve Schneider,Michael Goldsmith,Gavin Lowe, Bill Roscoe: The Modeling and Analysis of Security Protocols: The CSP Approach - Addison Wesley

References:

1. Kenneth J Turner, :Using Formal Description Techniques :*An Introduction to Estelle, Lotos, and Sdl* - John Wiley & Sons Inc
2. Richard Lai Ajin Jirachiefpattana, Kluwer :*Communication Protocol Specification and Verification* - Academic Press
3. R Stevens :*TCP/IP Illustrated Vol1 and Vol2* , A-W

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

Assignment for Sessional marks shall be problems based on Matlab / any other software packages covering the syllabus above.

03.806 (5) (Elective VI) BIOMEDICAL ENGINEERING (T) 3-1-0

Module I

The Human Body – Overview. The heart and circulatory system. Electrodes, Sensors and Transducers. Bio electric Amplifiers – Introduction – Isolation and chopper stabilized Amplifiers – Input guarding. Electrocardio graphs. Physiological pressure and other cardiovascular measurements and devices. Human respiratory system and its measurement. Respiratory therapy equipment.

Module II

The human nervous system. Instrumentation for measuring brain function – Intensive and coronary care units. Medical laboratory instruments. Medical ultrasonography. Radiology and nuclear medicine equipment. Electromagnetic Interference to medical electronic equipments.

Module III

Bioinformatics – Introduction – Protein information resources – Genome information esources – DNA sequence analysis – Pairwise alignment techniques – Multiple sequence alignment – secondary database searching. Biomedical Telemetry Systems.

Text Books :

Module I Ref (1) [Ch 1, 2, 6, 7, 8, 9, 10 & 11]
Module II Ref (1) [Ch 12, 13, 14, 16, 17, 23 & 24]
Module III Ref (2) [Ch 1, 3, 4, 5, 6, 7 & 8] & Ref 4 (Ch. 9)

References:

1) Joseph J Carr & John M Brown – *Introduction to Biomedical Equipment Technology*, 4th edn., Pearson Education.
2) T. K. Attuwood & D J Pary Smith, *Introduction to Bioinformatics*, 1999, Pearson Education.
3) John G Webster. *Medical instrumentation - Application and Design,* Houghton Mifflin company, Boston.
4) R S Khandpur. *Handbook of Biomedical Instrumentation*, Tata McGraw Hill, New Delhi.
5) Leslie Cromwell, Fred J Weibell and Erich A Pfeiffer. *Biomedical Instrumentation and Measurements* Prentice Hall of India, New Delhi.
6) B D Ratner and Hoffman *An Introduction to Materials in Medicine*, Academic Press.

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

03.807 MICROWAVE & OPTICAL COMMUNICATION LAB (T) 0-0-4

1. Measurement of Antenna parameters
2. Verification of relation between λg, λc and λo.
3. Low & High VSWR measurements and impedance measurements.
4. Gunn oscillator characteristics
5. Reflex Klystron Repeller mode characteristics.
6. DC characteristics of LED and PIN photodiode.
7. Directivity and coupling factor of directional coupler.
8. Measurement of isolation of E-plane & H-plane TEEs
9. Measurement of Dielectric constant.
10. Determination of insertion loss and isolation loss using circulator.
11. Measurement of attenuation of fixed attenuator and to calibrate the variable attenuation.
12. To measure the Numerical Aperture of a fiber, after preparing the fiber ends.
13. To measure the attenuation per unit length of a fiber using the cutback method.
14. To couple laser light into a fiber and measure the far field power distribution of the fiber as a function of angle.

15. To optimize single mode coupling and find the V-number.
16. Optimize single mode coupling and determine the coupling loss.
17. Study of Mobile Communication using kits.

Note

For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design -25%
(b) Result & Performance -50%
(c) Viva voce -25%

Practical examination to be conducted covering entire syllabus given above.

03.808 PROJECT & VIVA VOCE (TA) 0-0-5

Project & Viva-voce – Internal Evaluation (150 marks)

Each student is expected to prepare a report on the project work done by him/her and present a paper highlighting the work done by him/her in a seminar. The student is expected to complete the project work assigned to him/her and submit the project report by the end of semester. This report shall be of a hard bound type and consist of design phase report as volume one and other part as volume two.

Marks shall be awarded by continuous evaluation of minimum two times in this semester. (25 marks for evaluation of the report, 25 marks for presentation, 50 marks for viva and 50 marks for results / product)

Evaluation of report, results, presentation and viva will be conducted by a committee consisting of the guide, project coordinator and a senior faculty.

Project & Viva - Voce – University Examination (100 Marks)

(Examiners shall be senior staff members)

The students shall prepare for an oral examination based on Electronics, Communication, Electronic Instrumentation, other related and advanced topics. Viva-Voce examination shall also be based on Project and Seminar.

Students shall submit their Seminar Report (Certified during 7th Semester) and Project Report (consists of design phase report, Implementation and results report) for viva-voce. Marks for Project shall have weightage for valid results only.

Marks shall be awarded as

General Topics	:	50 Marks
Project (Results)	:	25 Marks
Seminar	:	25 Marks