UNIVERSITY OF CALICUT

Faculty of Engineering

Curriculum, Scheme of Examinations and Syllabi for B.Tech Degree Programme with effect from Academic Year 2000-2001

EC: Electronics & Communication Engineering

COMBINED FIRST AND SECOND SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
EN2K 101	Engineering Mathematics I	3	-	-	50	3	100
EN2K 102	Engineering Mathematics II	3	-	-	50	3	100
EN2K 103A	Engineering Physics(A)	2	-	-	50	3	100
EN2K 103A(P)	**Physics Lab(A)**	-	-	1	25	-	-
EN2K 104A	Engineering Chemistry(A)	2	-	-	50	3	100
EN2K 104A(P)	**Chemistry Lab(A)**	-	-	1	25	-	-
EN2K 105	Humanities	2	-	-	50	3	100
EN2K 106A	Engineering Graphics(A)	1	-	3	50	3	100
EN2K 107A	Engineering Mechanics(A)	2	1	-	50	3	100
EN2K 108	Computer Programming in C	2	1	-	50	3	100
EC2K 109	Basic Electrical Engineering	2	1	-	50	3	100
EC2K 110(P)	**Mechanical Workshop**	-	-	2	50	-	-
EC2K 111(P)	**Electrical & Electronics Workshop**	-	-	2	50	-	-
TOTAL		**19**	**3**	**9**	**600**	**-**	**900**

EN2K 101 : MATHEMATICS I

(common for all B. Tech. programmes)

3 hours lecture per week

Module I: Differential Calculus (15 hours)

Indeterminate forms - L` hospital`s rule - radius of curvature - centre of curvature - evolute - functions of more than one variable - idea of partial differentiation - Euler`s theorem for homogeneous functions - chain rule of partial differentiation - applications in errors and approximations - change of variables - Jacobians - maxima and minima of functions of two or more variables - method of Lagrange multipliers

Module II: Infinite Series (15 hours)

Notion of convergence and divergence of infinite series - ratio test - comparison test - Raabe`s test - root test - series of positive and negative terms - idea of absolute convergence - test for alternating series - power series - interval of convergence - Taylors and Maclaurins series representation of functions - Leibnitz formula for the n^{th} derivative of the product of two functions - use of Leibnitz formula in the Taylor and Maclaurin expansions

Module III: Matrices (21 hours)

Concept of rank of a matrix - reduction of a matrix to echelon and normal forms - system of linear equations - consistency of linear equations - gauss` elimination - homogeneous linear equations - fundamental system of solutions - inverse of a matrix - solution of a system of equations using matrix inversion - Eigen values and Eigen vectors - Cayley-Hamilton theorem - Eigen values of Hermitian, Skew-Hermitian and unitary matrices - quadratic forms - matrix associated with a quadratic form - technique of diagonalization using row and column transformations on the matrix - definite, semidefinite and indefinite forms - their identification using the Eigen values of the matrix of the quadratic form

Module IV: Fourier series and harmonic analysis (15 hours)

Periodic functions - trigonometric series - Fourier series - Euler formulae - even and odd functions - functions having arbitrary period - half range expansions - approximation by trigonometric polynomials - minimum square error - numerical method for determining fourier coefficients - harmonic analysis

Reference books

1. *Piskunov N., Differential and Integral calculus , MIR Publishers*
2. *Wylie C.R., Advanced Engineering Mathematics , McGraw Hill*
3. *Ayres F., Matrices , Schaum's Series, McGraw Hill*
4. *Kreyszig E., Advanced Engineering Mathematics , Wiley Eastern*
5. *Thomas G.B., Calculus and Analytic Geometry , Addison Wesley*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 1 5marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with choice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one

EN2K 102 : MATHEMATICS II

(common for all B. Tech. programmes)

3 hours lecture per week

Module I: Ordinary differential equations (21 hours)

A brief review of the methods of solutions of first order equations - separable, homogeneous and linear types - exact equations - orthogonal trajectories - general linear second order equations - homogeneous linear equation of the second order with constant coefficients - fundamental system of solutions - method of variation of parameters - Cauchy's equation - simple applications of differential equations in engineering problems, including problems in mechanical vibrations, electric circuits and bending of beams

Module II: Laplace transforms (15 hours)

Gamma and beta functions - definitions and simple properties - Laplace transform - inverse transform - Laplace transform of derivatives and integrals - shifting theorems - differentiation and integration of transforms - transforms of unit step function and impulse function - transform of periodic functions - solution of ordinary differential equations using Laplace transforms

Module III: Vector differential calculus (15 hours)

Vector function of single variable - differentiation of vector functions - scalar and vector fields - gradient of a scalar field - divergence and curl of vector fields - their physical meanings - relations between the vector differential operators

Module IV: Vector integral calculus (15 hours)

Double and triple integrals and their evaluation - line, surface and volume integrals - Green`s theorem - Gauss` divergence theorem - Stokes` theorem (proofs of these theorems not expected) - line integrals independent of the path

Reference books

1. *Wylie C.R., Advanced Engineering Mathematics, McGraw Hill*
2. *Spiegel M.R., Vector Analysis , Schaum Series, McGraw H ill*
3. *Kreyszig E., Advanced Engineering Mathematics , Wiley Eastern*
4. *Thomas G.B., Calculus and Analytic Geometry , Addison Wesley*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 15marks from module II with choice to answe r any one
Q IV - 2 questions A and B of 15marks from module III with choice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one

EN2K 103A : ENGINEERING PHYSICS(A)

(common for AI, CS, EE, EC, IT, IC, PT)

2 hours lecture per week

Module I (11 hours)

Interference of light - interference from plane parallel thin films - colours of thin films by reflected light - newtons rings - measurement of wave length - thin wedge shaped air film - air wedge - testing of optical planes of surfaces - diffraction of light - introduction of fresnel and fraunhofer diffraction - distinction between the two diffractions - simple theory of plane transmission grating - polarisation of light - double refraction - nicol prism - quarter and half

wave plates - production and detection of elliptically and circularly polarised light - rotatory polarisation - lawrent's half shade polarimeter - applications of polarised light

Module II (11 hours)

Quantum mechanics - Newtonian mechanics and quantum mechanics - the wave function - Schrodinger's wave equation for free particle - potentials in Schrodinger equation - time dependent Schrodinger equation - time independent Schrodinger equation - expectation values - derivation of Schrodinger equation -application - particle in a box (motion in one dimension) - ultrasonics - Piezo effect - Piezo electric crystal production and detection of ultrasonics - applications of ultrasonics - NMR and ESR - basic principles of Nuclear Magnetic Resonance (NMR) and Electron Spin Resonance (ESR) - experimental method for detection of NMR and ESR - applications

Module III (11 hours)

Laser physics - basic concepts of laser - spontaneous and stimulated emission - absorption - population inversion - optical pumping - construction and components of laser - ruby laser - helium - neon laser and semiconductor laser - applications - basic principle of holography and its application - fibre optics - basic principle - Fibre constructions - Fibre dimensions - light propagation in fibre - signal distortion in optical fibres and transmission losses (brief ideas only) - light wave communication using optical fibres and its advantages - applications

Module IV (11 hours)

Semiconductor physics - energy band diagrams - classifications of semiconductors on the basis of Fermi level and Fermi energy - impurity level in N-type and P-type semiconductors - applications of semiconductors - Zener diode, light emitting diode, solar cell, phototransistor, photo resister (LDR) - hall effect introduction - measurement of hall voltage and hall coefficient - importance of hall effect - super conductivity - properties of superconductors - Josephson effect and tunnelling (qualitative) - BCS theory of superconductivity (qualitative) - applications of superconductivity

Text and reference books

1. *Sreenivasan M.R., Physics for Engineers , New Age International*
2. *Vasudeva A.S., Modern Engineering Physics , S. Chand*
3. *Brijlal & Subrahmanyam, N, Text book of Optics , S.Chand*
4. *Jenkins F.A & White, H.E, Fundamentals of Optics , McGraw Hill*
5. *Kale Gokhale; Fundamentals of Solid State Electronics , Kitab Mahal*
6. *Gupta S.L. & Kumar, V; Solid State Physics , K. Nath*
7. *Srivastva C.M. & Sriniva san, C; Science of Engineering Materials , New Age International*
8. *Rajam J.B; Modern Physics , S. Chand*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 15marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with choice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one

EN2K 104A : ENGINEERING CHEMISTRY(A)

(common for AI, CS, EE, EC, IT, IC, PT)

2 hours lecture per week

Module I (13 hours)

Structure of solids - geometry of crystalline solids - space lattices - crystal structure - Bragg's law of X-ray diffraction - covalent solids - ionic solids - metals and alloys - noncrystalline states - crystal imperfections - point defects - dislocations - conductors and resistors - free electron theory - super conductors - semiconductors - intrinsic and extrinsic - semiconductor materials and their fabrication - liquid crystals - dielectric materials - polarization - feroelectric materials

Module II (9 hours)

Electrochemistry - electrode potentials - types of electrodes - salt bridge - emf measurement - concentration cells - acids and bases - buffer solutions - ph measurement - glass electrode - polarization - over voltage - secondary cells and fuel cells

Module III (9 hours)

Corrosion - protective coatings and pollution - dry corrosion - oxidation processes - wet corrosion - electrochemical theory - different forms of corrosion - prevention and control - protective coating - pretreatment of surface - metallic and nonmetallic coatings - electro deposition - cementation - metal spraying - air pollution - types - causes - power generation pollution - thermal pollution - petrochemical smog - methods of control

Module IV (13 hours)

High polymers and lubricants - polymerisation and functionality - chain, condensation and copolymerisation - mechanism - coordination polymerisation - polymerisation processes - structure, properties and molecular weight of polymers - thermosetting and thermoplastics materials - application in electrical and electronic industries - elastomers - vulcanization - synthetic rubbers - lubricants - theory of friction - mechanisms of lubrication - classification and properties of lubricants - additives - synthetic lubricants - solid lubricants

Reference books

1. *Kuriakose J.C. & Rajaram J., Chemistry in Engineering and Technology Vols 1 & 2 , Tata McGraw Hill*
2. *Raghavan V., Materials Science and Engineering - A First Course , Prentice Hall*
3. *Sawyer C.N. & McGarpy P.L., Chemistry for Environmental Engineering , McGraw Hill*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 mar ks, 2 from each module
Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 15marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with c hoice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one

EN2K 105 : HUMANITIES

(common for all B. Tech. programmes)

2 hours lecture per week

Module I (10 hours)

Introduction to English usage and grammar

Review of grammar - affixes, prefixes, suffixes, participles and gerunds - transformation of sentences - commonly misspelt words - correction of mistakes - punctuation - idioms - style - vocabulary building

Reading comprehension

Exposure to a variety of reading materials, articles, essays, graphic representation, journalistic articles, etc.

Writing comprehension

Skills to express ideas in sentences, paragraphs and essays

Module II (10 hours)

Technical communication and report writing

Growing need and importance of technical communication - aspects of technical description of machinery, equipment and processes - giving instructions in an industrial situation - note taking and note making - correspondence on technical topics - different types of technical reports

Module III (10 hours)

Humanities in a technological age

Importance of humanities to technology, education and society - relation of career interests of engineers to humanities - relevance of a scientific temper - science, society and culture introduction to writings of modern thinkers on society and culture

Technology

Historical concepts and current usage (*this module should be a window to the world of western and eastern mind with an emphasis on exposition of topical ideas through cohere nt language*).

Module IV (14 hours)

History of science and technology

Science and technology in the primitive society - development of science and technology in early civilised societies - Science and classical Greece - the rise and development of early Indian science - contributions of the Arabs to science and technology - European science and the

revolutionary (industrial, American and French revolutions) era - recent advances in Indian science

Reference books

1. *Huddleston R, English Grammer - An outline , Cambridge University Press*
2. *Pennyor, Grammar Practice Activities , Cambridge University Press*
3. *Murphy, Intermediate English Grammar , Cambridge University Press*
4. *Hashemi, Intermediate English Grammar - Supplementary Exercises with answers ", Cambridge University Press*
5. *Vesilind; Engineering, Ethics and the Environment , Cambridge University Press*
6. *Larson E; History of Inventions , Thompson Press India Ltd.*
7. *Bernal J. D, Science in History , Penguin Books Ltd*
8. *Dampier W. C, History of Science ", Cambridge University Press*
9. *Encyclopedia Britannica, History of Science, History of Technology*
10. *Subrayappa; History of Science in India , National Academy of Science, India*
11. *Brownoski J, Science and Human Values , Harper and Row*
12. *Schrodinger, Nature and Greeks and Science and Humanism , Cambridge University Press*
13. *Bossel, H, Earth at a Crossroads - paths to a sustainable Future , Cambridge University Press*
14. *McCarthy, English Vocabulary in Use , Cambridge University Press*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 f rom each module
Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 15marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with choice t o answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one

EN2K 106A : ENGINEERING GRAPHICS(A)

(common for AI, CS, EE, EC, IT, IC, PT)

1 hour lecture and 3 hours drawing

Module 0 (12 hours - 1 drawing exercise)

Introduction to engineering graphics - drawing instruments and their uses - different types of lines - lettering and dimensioning - familiarisation with current Indian standard code of practice for general engineering drawing - construction of ellipse, parabola and hyperbola - construction of cycloid, involute and helix (only practice, no university examination)

Module I (18 hours - 3 drawing exercises)

a) Introduction to orthographic projections - vertical, horizontal and profile planes - principles of first angle and third angle projections - projections of points in different quadrants - orthographic projections of straight lines parallel to one plane and inclined to the other plane - straight lines

inclined to both the planes - true length and inclination of lines with reference planes - traces of lines

b) Projections of polyhedra and solids of revolution - frustums - projections of solids with axis parallel to one plane and paralel to or perpendicular to the other plane - projections of solids with the axis inclined to both the planes (solids to be drawn - cube, prism, pyramid, tetrahedron, cone and cylinder)

Module II (18 hours - 3 drawing exercises)

a) Sections of solids - sections by planes parallel to the horizontal or vertical planes and by planes inclined to the horizontal or vertical planes - true shape of section by projecting on auxiliary plane (solids to be drawn: - cube, prism, pyramid, tetrahedron, cone and cylinder)

b) Development of surfaces of solids - method of parallel line, radial line, triangulation and approximate developments - development of polyhedra, cylinder, cone and sectional solids - development of solids having hole or cut

Module III (18 hours - 3 drawing exercises)

a) Introduction to isometric projection - isometric scale - isometric views - isometric projections of prisms, pyramids, cylinders, cones, spheres, sectioned solids and their combinations - principle of oblique projection - cavalier, cabinet and general oblique projections of solids and simple objects

b) Introduction to multiview projection of objects - principle of six orthographic views - conversion of pictorial views of simple engineering objects into orthographic views

Module IV (22 hours - 6 drawing exercises)

a) Introduction to machine drawing - types of sectional views - full-sectional and half-sectional views of simple machine components

b) Conventional representation of threaded fasteners - drawing of nuts, bolts, washers and screws - locking arrangements of nuts - bolted and screwed joints - foundation bolts of eye end type, hook end type and split end type

Note: All drawing exercises mentioned above are for class work. Additional exercises wherever necessary may be given as home assignments

Reference books

1. *John K.C. & Varghese P.I, Engineering Graphics , Jet Publications*
2. *Bhatt N.D, Elementary Engineering Drawing , Charotar Publishing House*
3. *John K.C. & Varghese P. I, Machine Drawing , Jovast Publishers*
4. *Bhatt N.D, Machine Drawing , Charotar Publishing House1.*
5. *Narayana K.L & Kannaiah, P, Engineering Graphics , Tata McGraw Hill*
6. *Luzadder W.J, Fundamentals of Engineering Drawing , Prentice Hall of India*

Sessional work assessment

Drawing exercises (Best 10)	*10x3 = 30*
2 tests	*2x10 = 20*
Total marks	*= 50*

University examination pattern

No question from module 0
Q I - 2 questions A and B of 20marks from module I with choice to answer any one
Q II - 2 questions A and B of 20marks from module II with choice t o answer any one
Q III - 2 questions A and B of 20marks from module III with choice to answer any one
Q IV - 2 questions A and B of 40marks from module IV with choice to answer any one

EN2K 107A : ENGINEERING MECHANICS(A)

(common for AI, CH, CE, CS, EE, EC, IT, IC, PT

2 hours lecture and 1 hour tutorial per week

Objectives

To build a strong foundation in Engineering Mechanics to serve as a basis for strength of materials, Mechanics of Solids and Structural Analysis
To acquaint the student wi th general methods of analysing engineering problems
To illustrate the application of the methods to solve practical engineering problems

Module I (17 hours)

Principles of statics - freebody diagrams - composition and resolution of forces - resultant and equilibrant- concurrent forces - triangle of forces - Lami's therem - method of projections - method of moments-theorem of varignon - parallel forces - couples - centre of parallel forces and centre of gravity - conditions of equilibrium for general system of coplanar forces - polygon of forces - resultant of a system of coplanar forces - friction - laws of friction - angle of friction - equilibrium of a body on a rough inclined plane

Module II (17 hours)

Plane trusses - different types of supports - reactions at supports - method of joints - method of sections -graphical method - funicular polygon - maxwell diagrams - distributed forces in a plane - flexible suspension cables - introduction to vector approach - concurrent and parallel forces in space - couples in space - equilibrium of general system of forces in space - solution of problems by scalar and vector approach

Module III (16 hours)

Principle of virtual work - application to practical problems - stable and unstable equilibrium - simple machines - centroids and moments of inertia of plane figures of various shapes-rectangle, triangle, circle, semicircle and builtup sections - parallel and perpendicular axes theorems - product of inertia - principal axes and principal moments of inertia - moment of inertia of a rigid body - moment of inertia of a lamina -moment of inertia of three dimensional bodies

Module IV (16 hours)

Principles of dynamics - differential equation of rectilinear motion - motion of a particle acted upon by a constant force - force as a function of time - force proportional to displacement - free vibrations - D'Alembert's principle - momentum and impulse - work and energy - ideal systems - conservation of energy - impact - plastic, semielastic and elastic - curvilinear motion - differential equation - D' Alembert's principle - work and energy - moment of momentum - projectiles -

rotation - equation of motion - D' Alembert's principle - rotation under the action of constant moment - torsional vibration - compound pendulum

Text books

1. *Timeshenko & Young; Engineering Mechanics , McGraw Hill*
2. *Shames I. H, Engineering Mechanics - Statics and Dynamics , Prentice Hall of India*

Reference books

1. *Beer F. P & Johnston E. R, Mechanics for Engineers - Statics and Dynamics , McGraw Hill*
2. *Meriam J. L & Kraige L. G, Engineering Mechanics - Statics and Dynamics , John Wiley*
3. *Langhaar H. L & Boresi A. P, Engineering Mechanics , McGraw Hill*
4. *Rajasekaran & Sankarasubramanian, Engineering Mechanics , Vikas Publishing Company*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 15marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with choice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one

EN2K 108 : COMPUTER PROGRAMMING IN C

(common for all B. Tech. programmes)

2 hours lecture and 1 hour practical per week

Module I (11 hours)

Programming and problem solving - computer organisation - high level and low level languages - steps involved in computer programming - developing algorithms and flow charts - efficiency of algorithms - running - debugging and testing of programs - program design methods - top-down modular programming - measures of program performance

Module II (20 hours)

Basics of C - overview of C - lexical elements - operators and the c system - fundamental data types - flow of control - functions

Module III (20 hours)

More on C - arrays - pointers and strings - bit-wise operators and enumeration types - structures and unions - linear linked lists and list operations - basic I/O functions

Module IV (15 hours)

Introduction to object oriented programming - principles of OOP - object oriented programming paradigm - basic concepts of OOP - benefits of OOP - object-oriented languages - applications of

OOP - moving from C to C++ - input /output functions - classes and abstract data types - overloading - constructors and destructors - inheritance - polymorphism - templates

Text book

Kelley A & Pohl I, A Book on C , Addison Wesley

Reference books

1. *Schneider G.M., Weigngart S.W. & Perlman D.M.; An introduction to Programming and Problem Solving with Pascal , John Wiley*
2. *Balag urusamy E, Object Oriented Programming with C++ ", Tata McGraw Hill*
3. *Venugopal K.R. & Prasad S. R, Programming with C , Tata McGraw Hill*
4. *Gotfried B., Programming in C ++, Schaum's Outline Series, McGraw Hill*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 15marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with choice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choic e to answer any one

EC2K 109 : BASIC ELECTRICAL ENGINEERING

(common with AI2K 109, EE2K 109, IC2K 109)

2 hours lecture and 1 hour tutorial per week

Module 1 (20 hours)

Introductory circuit analysis - two terminal resistance - independent voltage and current sources - dependent voltage and current sources - Ohm's law - Kirchoff's laws - solution of simple series, parallel, series-parallel circuits with DC excitation - solution of resistive circuits with dependent sources - node analysis and mesh analysis - nodal conductance matrix and mesh resistance matrix and effect of dependent sources on these matrices - source transformation - Thevenin's theorem and norton's theorem - magnetic circuits - MMF - magnetic flux - reluctance - comparison of ferromagnetic material - magnetisation curves of ferromagnetic materials - energy stored in a magnetic field - solution of magnetic circuits - inductance - Faraday's law of electromagnetic induction - Lenz's law - statically and dynamically induced e.m.f - self and mutual inductance - inductances in series and parallel - mutual flux and leakage flux - coefficient of coupling - dot convention - cumulative and differential connection of coupled coils - BH curve and inductance - hysteresis loop - capacitance - electrostatics - capacitance - parallel plate capacitor - capacitors in series and parallel - charging and discharging of capacitor - energy stored in electrostatic fields - potential gradient - dielectric strength

Module II (16 hours)

Two terminal element relationships - v-i relationship for inductance and capacitance - constant flux linkage theorem and constant charge theorem - v-i relationship for independent voltage and current sources - v-i relationship for dependent voltage and current sources - source functions - unit impulse - unit step - unit ramp and inter relationship - sinusoidal input - generalised exponential input - linearity - concept of a linear element - concept of time invariance - concept of a linear circuit - superposition theorem - substitution theorem - passive vs active elements - bilateral elements - time domain analysis of circuits - linear differential equations for series RC,

parallel RC, series RL, parallel RL, series RLC, parallel RLC and coupled circuits - complete solution for step/impulse/sinusoid voltage/current inputs - natural response - transient response - time constant - rise and fall times - concept of d.c steady state and sinusoidal steady state - frequency response of simple circuits from steady state solution - solution of two mesh circuits by differential equation method - determination of initial conditions

Module III (15 hours)

Single phase a.c circuits - alternating quantities - generation of sinusoidal e.m.f - average value - effective value - form and peak factors for square, triangle, trapezoidal and sinusoidal waveforms - phasor representation of sinusoidal quantities - phase difference - addition and subtraction of sinusoids - symbolic representation - Cartesian, polar and exponential forms - analysis of a.c circuits R, RL, RC, RLC circuits using phasor concept - concept of impedance, admittance, conductance and susceptance - relation between s-domain immittance functions and phasor impedance/admittance - power in single phase circuits - instantaneous power - average power - active power - reactive power - apparent power - power factor - complex power - solution of series, parallel and series-parallel a.c circuits - application of Thevenin's theorem and Norton's theorem for a.c. circuits - maximum power transfer theorem - series and parallel RLC resonant circuits - frequency response - resonance - Q factor - half power frequencies - bandwidth

Module IV (15 hours)

Analysis of polyphase circuits - polyphase working - two phase and three phase systems - 3 phase a.c systems - balanced system - phase sequence - star delta transformation theorem - balanced 3 phase a.c source supplying balanced 3 phase star connected and delta connected loads - three phase loads with mutual coupling between phases - 3 wire and 4 wire systems - neutral shift - neutral current - active power, reactive power, complex power, apparent power and power factor in balanced and unbalanced three phase systems - measurement of power in balanced and unbalanced systems - symmetrical components - analysis of unbalanced systems using symmetrical components - sequence impedances - analysis of three phase unbalanced systems with mutual coupling between phases using symmetrical components - sequence coupling

Reference books

1. Kothari D.P & Nagarath I. J, *Theory & Proble ms of Basic Electrical Engineering* , Prentice Hall of India
2. Hayt & Kimmerly; *Engineering Circuit Analysis* , McGraw Hill
3. Siskind C.S, *Electric Circuits* , McGraw Hill
4. Nilsson J.W. & Riedel S.A., *Electric Circuits* , Addison Wesley
5. Edminister J.A., *Electric Circui ts, Schaum's Series* , McGraw Hill
6. Desoer C.A. &Kuh E. S, *Basic Circuit Theory* , McGraw Hill

Sessional work assessment	
Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15marks from module I with choice to answer any one
Q III - 2 questions A and B of 15marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks from module III with choice to answer any one
Q V - 2 questions A and B of 15marks from module IV with choice to answer any one

EC2K 110(P) : MECHANICAL WORKSHOP

[common with AI2K 110(P), EE2K 110(P), IC2K 110(P)]

2 hours practicals per week

Module I (12 hours)
Machine shop practice - study of different machine tools - lathe - shaper - milling machine - drilling machine - grinding machine - exercises on lathe-models involving straight turning straight turning, taper turning, facing, knurling, boring and thread machining - thread standards and specifications

Module II (12 hours)
Fitting practice - study of hand tools and measuring tools used in fitting work - fabrication exercises involving cutting, chiseling, filing and drilling - use of thread dies and taps

Module III (10 hours)
Welding practice - study of electric arc welding and gas welding equipment, accessories and tools - safety practices - exercises involving preparation of different types of welded joints - lap and butt joints - defects in welding - testing of welded joints - gas cutting equipment and demonstration

Module IV (10 hours)
Sheet metal practice - study of shearing bending and folding machines, press brake etc. used in sheet metal work - hand tools in sheet metal work - development and fabrication of simple sheet metal components like cylindrical dish, funnel, rectangular duct, tray, panel board etc, - soldering and brazing of joints - die cutting operations

Sessional work assessment	
Workshop practicals and record	= 30
2 tests	2x10 = 20
Total marks	= 50

EC2K 111(P) : ELECTRICAL & ELECTRONICS WORKSHOP

[common with AI2K 111(P), CS2K 111(P), IT2K 111(P), IC2K 111(P), PT2K 111(P)]

2 hours practicals per week for AI, EC, IC

3 hours practicals per week for CS, IT, PT

Part A: Electrical Workshop (2/3 hours per alternate weeks)

1. Familiarisation of various types of service mains - wiring installations - accessories and house-hold electrical appliances
2. Methods of earthing - measurement of earth resistance - testing of electrical installations - precautions against and cure from electric shock
3. Practice of making Britannia joints on copper / aluminium bare conductors
4. Practice of making Married joints on copper / aluminium conductors
5. Practice of making T joints on copper / aluminium conductors

6. Wiring practice of a circuit to control 2 lamps by 2 SPST switches
7. Wiring practice of a circuit to control 1 lamp by 2 SPDT switches
8. Wiring practice of a circuit to control 1 fluorescent lamp and 1 three-pin plug socket
9. Wiring practice of a main switch board consisting of ICDP switch, DB, MCB's, and ELCB's
10. Familiarisation of various parts and assembling of electrical motors and wiring practice of connecting a 3-phase / 1-phase motor with starter

Sessional work assessment	
Workshop practicals and record	= 15
Test/s	= 10
Total marks	= 25

Part B - Electronics Workshop (2/3 hours per alternate weeks)

1. Familiarisation of various electronics components such as resistors, capacitors, transistors, diodes, IC's and transformers
2. Assembling and soldering practice of single phase full wave bridge rectifiers circuit with capacitor filter
3. Assembling and soldering practice of common emitter amplifier circuit
4. Assembling and soldering practice of common emitter amplifier circuit on PCB
5. Assembling and soldering practice of non inverter amplifier circuit using OPAMP on PCB
6. Assembling of a timer circuit IC555, phase shift oscillator circuit using OPAMP and JK flip-flop using NAND gates on a bread-board
7. Coil winding - Single layer and multi layer - Demonstration
8. Miniature transformer winding - Demonstration
9. PCB fabrication - Demonstration

Sessional work assessment	
Workshop practicals and record	= 15
Test/s	= 10
Total marks	= 25

UNIVERSITY OF CALICUT

Faculty of Engineering

Curriculum, Scheme of Examinations and Syllabi for B.Tech Degree Programme with effect from Academic Year 2000-2001

EC: Electronics & Communication Engineering

THIRD SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
EC2K 301	Engineering Mathematics III	3	1	-	50	3	100
EC2K 302	Electrical Circuits & Network Theory	3	1	-	50	3	100
EC2K 303	Solid State Devices	3	1	-	50	3	100
EC2K 304	Basic Electronics	3	1	-	50	3	100
EC2K 305	Digital Electronics	3	1	-	50	3	100
EC2K 306	Electrical Engineering	3	1	-	50	3	100
EC2K 307(P)	**Basic Electronics Engineering Lab**	-	-	3	50	3	100
EC2K 308(P)	**Electrical Engineering Lab**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

EC2K 301 : ENGINEERING MATHEMATICS III

(same as AI2K/CH2K/CE2K/EE2K/IC2K/ME2K/PE2K/PM2K/PT2K 301)

3 hours lecture & 1 hour tutorial per week

Module I: Linear algebra I (13 hours)

Vector spaces - subspaces - linear dependence and independence - bases and dimension - linear transformations - sums, products and inverses of linear transformations - linear operator equations

Module II: Linear algebra II (13 hours)

Rank and equivalence of matrices - quadratic forms - characteristic values and characteristic vectors of a matrix - transformation of matrices - functions of a square matrix

Module III: Probability distributions (13 hours)

Random variables - binomial distribution - hypergeometric distribution - Poisson distribution - mean and variance of probability distribution - Chebyshev's theorem - Poisson processes - geometric distribution - continuous random variables - normal distribution - uniform, log-normal, gamma, beta and Weibull distributions

Module IV: Statistical inference (13 hours)

Populations and samples - sampling distributions of mean and variance - point estimation - interval estimation - Bayesian estimation - null hypotheses and significance tests - hypothesis concerning one mean - relation between tests and confidence intervals - operating characteristic curves - inferences concerning two means - randomization and pairing - estimation of variances - hypotheses concerning one variance - hypotheses concerning two variances - test of goodness of fit

Text books

1. Wylie C.R. & Barrett L.C., *Advanced Engineering Mat hematics,* McGraw Hill

2. Johnson R.A., *Miller & Freund's Probability & Statistics for Engineers,* Prentice Hall of India

Reference books

1. Hadley G., *Linear Algebra* , Addison Wesley
2. Kreyszig E., *Advanced Engineering Mathematics* , Wiley Eastern
3. Kreider D.L., Kuller R.G., Osterberg & Perkins F.W., *Introduction to Linear Analysis* , Addison Wesley
4. Levin R.I. & Rubin D.S., *Statistics for Management* , Prentice Hall of India
5. Lipschutz S., *Linear Algebra - Schaum's Outline Series* , McGraw Hill
6. Chatfield C., *Statistics for Tec hnology,* Chapman & Hall
7. Walpole R.E. & Meyers, *Probability & Statistics for Engineers & Scientists,* Prentice Hall of India

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EC2K 302 : ELECTRICAL CIRCUITS & NETWORK THEORY

3 hours lecture and 1 hour tutorial per week

Module I (10 hours)

Circuit elements and sources - dependent and independent sources - network theorems - review of Thevenin's & Norton's theorem - superposition theorem - maximum power transfer theorem - first and second order circuits - zero state response - zero input response-complete response-step response and impulse response of first and second order circuits

Module II (13 hours)

S-Domain analysis of circuits - review of Laplace transform - convolution theorem and convolution integral - transformation of a circuit into S-domain - transformed equivalent of inductance, capacitance and mutual inductance - impedance and admittance in the transform domain - node analysis and mesh analysis of the transformed circuit - nodal admittance matrix - mutually coupled circuits - input and transfer immittance functions - transfer functions - impulse response and transfer function - poles and zeros - pole zero plots - sinusoidal steady state from Laplace transform inversion - frequency response by transform evaluation on j-axis - frequency response from pole-zero plot by geometrical interpretation

Module III (16 hours)

Two port networks: two port networks - characterization in terms of impedance - admittance - hybrid and transmission parameters - inter relationships among parameter sets - reciprocity theorem - interconnection of two port networks - series, parallel and cascade - network functions - pole zero plots and steady response from pole - zero plots

Symmetrical two port networks : T and π equivalent of a two port network - image impedance - characteristic impedance and propagation constant of a symmetrical two port network - properties of a symmetrical two port network
Symmetrical two port reactive filters : filter fundamentals - pass and stop bands - behavior of iterative impedance - constant - k low pass filter - Constant - k high pass filter-m-derived T and π sections and their applications for infinite attenuation and filter terminations - band pass and band elimination filters

Module IV (13 hours)

Synthesis: positive real functions - driving point functions - Brune's positive real functions - properties of positive real functions - testing driving point functions - application of maximum module theorems - properties of Hurwitz polynomials - even and odd functions - Strum's theorem - driving point synthesis - RC elementary synthesis operations - LC network synthesis - properties of RC network functions - foster and Cauer forms of RC and RL networks

Text books

1. Gupta B.R. & Singhal V., *Fundamentals of Electrical Networks* , Wheeler Pub
2. Van Valkenberg M.E., *Introduction to Modern Network Synthesis* , Wiley Eastern
3. Van Valkenberg, *Network Analysis,* Prentice Hall of India

Reference books

1. Desoer C.A. & Kuh E.S., *Basic Circuit Theory,* McGraw Hill
2. Siskind, *Electrical Circuits.* McGraw Hill
3. Ryder J.D., *Networks, Lines and Fields* , Prentice Hall
4. Edminister, *Electric Circuits , Schaum's Outline Series* , McGraw Hill
5. Huelsman L.P., *Basic Circuit Theory*. Prentice Hall of India

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EC2K 303 : SOLID STATE DEVICES

3 hours le cture and 1 hour tutorial per week

Module I (13 hours)

Energy bands and charge carriers in semiconductors - direct and indirect band gap semiconductors - concept of effective mass - intrinsic and extrinsic semiconductors - Fermi level - electron and hole concentrations at equilibrium - temperature dependence of carrier concentrations - conductivity and mobility - quasi Fermi level - diffusion and drift of carriers - Einstein relation - continuity equation

Module II (13 hours)

PN junctions - contact potential - space charge at a junction - current flow at a junction - carrier injection - diode equation - minority and majority carrier currents - capacitance of pn junctions -

reverse bias breakdown - zener and avalanche breakdown - abrupt and graded junctions - schottky barrier - rectifying and ohmic contacts - tunnel diode - varactor diode - zener diode - Ga As isotype diodes

Module III (13 hours)

Charge transport in a bipolar junction transistor - current and voltage amplification - concept of load line - analysis of transistor currents - Ebers-Moll model - early effect - concept of early voltage - avalanche breakdown in transistors - transit time effects - Kirk effect - Hetero junction GaAs BJTs - UJT - concept of dynamic negative resistance

Module IV (13 hours)

Junction FET - pinch off and saturation - gate control - VI characteristics - MOS capacitor - accumulation, depletion and strong inversion - threshold voltage - MOSFET - p channel and n channel MOSFETs - depletion and enhancement mode MOSFETs - substrate bias effects - floating gate MOSFETs - short channel effects - GaAs MESFET

Text books

1. Streetman B.G., *Solid State Electronic Devices* , Prentice Hall of India
2. Sze S.M., *Physics of Semiconductor Devices* , Wiley Eastern
3. *Physics of Semiconductor Devices* , Michael A.Shur, Prentice Hall of India

Reference books

1. Millman & Halkias, *Integrated Electronics* , McGraw Hill
2. Baker R.J., Li H.W. & Boyce D.E., *CMOS - Circuit Design, Layout and Simulation* , Prentice Hall of India
3. Kwok K N., *Complete Guide to Semiconductor Devi ces*, McGraw Hill
4. Yang E.S., *Microelectronics Devices* , McGraw Hill

Sessional work assessment	
Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EC 2K 304 : BASIC ELECTRONICS

(common with PT2K 304)

3 hours lecture and 1 hour tutorial per week

Module I (10 hours)

Thermionic emission - high field emission - secondary emission - Richardson's equation - Child-Langmuir law - vacuum tubes - diodes, triodes and pentodes - their characteristics & parameters - amplification

Module II (13 hours)

Resistors - types and tolerance - AF and RF chokes - transformers - types of capacitors - specifications & constructional details - rectifiers & filters - half wave, full wave and bridge rectifier configurations (analysis & design) - ripple factor - rectification efficiency - peak inverse voltage - transformer utilization factor - analysis & design of C, LC, CLC and CRC filters, m - phase rectifiers

Module III (12 hours)

Diode circuit models - DC - low frequency small signal and high frequency small signal models - voltage multiplier circuits, diode clipping and clamping circuits - regulators - zener diode regulator - series pass transistor feedback voltage regulator - emitter follower output regulator - short circuit protection - load and voltage regulation curves

Module IV (17 hours)

BJT circuit models - hybrid π model - small signal low frequency and small signal high frequency models of BJT - effect of temperature on BJT model parameters - h parameter equivalent circuits of CC, CB and CE configurations - current gain - voltage gain - input and output impedances - small signal low frequency and small signal high frequency models of MOSFET - effect of temperature on MOSFET model parameters - equivalent circuits of CS and CD configurations

Text books

1. Grob B., *Basic Electronics* , McGraw Hill
2. Milman & Halkias, *Electronic Devices & Ci rcuits*, McGraw Hill
3. Boylestad R. & Nashelsky L., *Electronic Devices & Circuit Theory* , Prentice Hall of India

Reference books

1. Bogart T.F., *Electronic Devices & Circuits* , McGraw Hill
2. Horenstein M.N., *Microelectronic Circuits & Devices* , Prentice Hall of India
3. Mottershead A., *Electronic Devices & Circuits* Prentice Hall of India

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions of 15marks from module I with choice to answer any one
Q III - 2 questions of 15marks from module II with choice to answer any one
Q IV - 2 questions of 15marks from module III with choice to answer any one
Q V - 2 questions of 15marks from module IV with choice to answer any one

EC2K 305 : DIGITAL ELECTRONICS

(common with AI2K 305)

3 hours lecture & 1 hour tutorial per week

Module I (12 hours)

Basic digital circuits - review of number systems and Boolean algebra - simplification of functions using Karnaugh map and Quine McCluskey methods - Boolean function implementation - code converters - encoders and decoders - multiplexers and demultiplexers - ROMs - combinational logic design using decoders - multiplexers and ROMs

Module II (12 hours)

Arithmetic circuits - half and full adders and subtractors - carry look ahead adders - BCD adder - multiplier and divider circuits - sequential circuits - latches and flip flops (RS, JK, D, T and Master Slave) - design and analysis of ripple counters - shift registers - Johnson and ring counters

Module III (14 hours)

Design and analysis of sequential circuits - general model of sequential networks - state diagrams - synchronous counter design - analysis of sequential networks - derivation of state graphs and tables - reduction of state table - sequential network design

Module IV (14 hours)

Logic families - fundamentals of RTL, IIL, DTL and ECL gates - TTL logic family - TTL transfer characteristics - TTL input and output characteristics - Tristate logic - Shottkey and other TTL gates - MOS gates - MOS inverter - CMOS inverter - rise and fall time in MOS and CMOS gates - speed power product - interfacing BJT and CMOS gates - semiconductor memories

Text books

1. Roth C.H., *Fundamentals of Logic Design* , Jaico Pub.
2. Mano M.M., *Digital Design* , Prentice Hall of India
3. Taub B. & Schilling D., *Digital Integrated Electronics* , McGraw Hill
4. Jain R.P., *Modern Digital Electronics* , Tata McGraw Hill

Reference books

1. Morris R.L., *Designing with TTL Integrated Circuits* , McGraw Hill
2. Katz R.H., *Contemporary Logic Design* , Benjamin/Cummings Pub.
3. Lewin D. & Protheroe D., *Design of Logic Systems* , Chapman & Hall

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EC2K 306 : ELECTRICAL ENGINEERING

(common with AI2K/PT2K 306)

3 hours lecture & 1 hour tutorial per week

Module I: DC machines (10 hours)

Types of DC machines - DC generators - emf equation - open circuit and load characteristics of different types of DC generators - DC motors - principle of operation - types - torque equation - characteristics - starters

Module II: Transformers (10 hours)

Principle of operation - emf equation - phasor diagram - equivalent circuit - OC and SC tests - basic principles of auto transformer and three phase transformer

Module III: AC machines (17 hours)

Alternator - rotating field - frequency effect of distribution of winding - emf equation - losses and efficiency of synchronous motor - torque equation - starting methods - induction motor - constructional features - principle of operation of 3 phase induction motor - vector diagram and equivalent circuits - starting and speed control of squirrel cage and wound rotor induction motor

Module IV: Electrical measurements (15 hours)

Principle of moving coil, moving iron and dynamometer type instruments - extension of range of voltmeter and ammeter - measurement of 3 phase power by two wattmeter method - DC slidewire, potentiometer - wheat stone bridge - Kelvin's double bridge - AC bridges - Schering bridge, Maxwell's bridge - principle of energy meter

Text book

Hughes E., *Electrical Technology* , ELBS

Reference books

1. Cotton H., *Electrical Technology* Pitman
2. Golding, *Electrical Measurements and Measuring Instruments* , ELBS

Sessional work assessment	
Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EC2K 307(P) : BASIC ELECTRONIC ENGINEERING LAB

3 hours practicals per week

1. Series resonant and parallel resonant circuits - voltage and current amplification
2. Diode & Zener diode characteristics - dc and dynamic resistance
3. Constant -k low pass and high pass filters
4. First and second order LPF/HPF/BPF with R and C for a given cut-off frequency
5. Clipping circuits with diodes
6. Clamping circuits & voltage multipliers
7. Half wave rectifier with C, LC & CRC filters

8. Full wave rectifiers with C, LC & CRC filters
9. Zener diode regulator with emitter follower output - regulation curves
10. UJT characteristics & the relaxation oscillator
11. CB configuration - determination of h parameters
12. CE configuration - determination of h parameters
13. MOSFET characteristics in CS and CD modes

Sessional work assessment	
Lab practicals & record	= 30
2 tests	2x10= 20
Total marks	= 50

4TH SEMESTER

EC2K 401 : ENGINEERING MATHEMATICS IV

(Same as AI2K 301, CH2K 401.CE2K 401, EE2K 401. IC2K 401. ME2K 401, PE2K 401, PM2K 401)

3 hours lecture & 1 hour tutorial per week

Module I: Functions of a complex variable & applications I (13 hours)
Functions of a complex variable - analytic functions - Cauchy-Riemann equations -elementary functions of z - conformal mapping - bilinear transformation - Schwarz-Christoffel transformation - transformation by other functions

Module II: Functions of a complex variable & applications II (13 hours)
Integration in the complex plane - Cauchy's integral theorem - Cauchy's integral formula - series of complex terms - Taylor's series - Laurent's series - residue theorem - evaluation of real definite integrals - complex inverse integral

Module III: Ordinary differential equations & special functions (13 hours)
Power series method of solving ordinary differential equations - theoretical preliminaries - series solution of Bessel's equation - modified Bessel functions - equations solvable in terms of Bessel-functions - identities for Bessel functions - Orthogonality-of Bessel functions - applications - Legendre polynomials

Module IV: Partial differential equations (13 hours)
Derivation of equations - D' Alembert's solution of the wave equation - characteristic and the classification of partial differential equations - separation of variables - orthogonal functions and the general expansion problem - further applications - Laplace transform methods

Text book

Wylie C.R. & Barrett L.C., Advanced Engineering Mathematics, McGraw Hill (Chapters 11, 12, 17, 18, 19 & 20 excluding section 11.9)

Reference books

1. Churchill R.V., Brown J.W. & Verhey R.F., Complex Variables & Applications, McGraw Hill
2. Kreider D.L., Kuller R.G., Ostberg D.R & Perkins F.W., An Introduction to Linear System Analysis, Addison Wesley
3. Kreyszig E,, Advanced Engineering Mathematics, John Wiley
4. Pipes L.A & Harvill L.R., Applied Mathematics for Engineers & Physicists. McGraw Hill

5. Sokolnikoff I.S. & Redheffer R.M, Mathematics of Physics & Modern Engineering, McGraw Hill

Sessional work assessment

Assignments	2x 10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module Ml with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EC 2K 402 : PULSE CIRCUITS

4 hours lecture per week

Module 1(13 hours)
RC circuit as integrator and differentiator - compensated attenuators - pulse transformer - pulse response switching characteristics of a BJT - BJT switches with inductive and capacitive loads - non saturating switches - emitter follower with capacitive loading -switching characteristics of a MOS inverter - resistive load & active load configurations - CMOS inverter - dynamic power dissipation

Module II (13 hours)
Monostable and astable multivibrators - collector coupled monoshot - emitter coupled monoshot - triggering the monoshot - collector coupled and emitter coupled astable multivibrator - astable'- monostable and bistable operations using negative resistance devices - multivibrators with 555 1C timer

Module III (13 hours)
Digital phase locked loops - phase detector (XOR & phase frequency detectors) -voltage controlled oscillator (current starved & source coupled CMOS configurations) -loop filter - analysis of PLL - typical applications of PLL - voltage and current time base generators - linearization - miller & bootstrap configurations

Module IV (13 hours)

Digital to analog converters - R-2R ladder - binary weighted - current steering - charge scaling - cyclic & pipeline DACs - accuracy - resolution - conversion speed - offset error - gain error - integral and differential nonlinearity - analog to digital converters - track and hold operation - track and hold errors - ADC conversion techniques - Hash converter -two step flash - pipeline - integrating - staircase converter - successive approximation converter - dual slope & oversampling ADCs - sigma - delta ADC

Text books

1. Mil I man J. & Taub H., Pulse, Digital & Switching Waveforms. Tata McGraw Hill
2. Baker R.J. ,Li H.W. & Boyce D.E., CMOS - Circuit Design, Layout & Simulation, Prentice Hall of India

Reference books

1. Taub& Schilling, Digital Integrated Electronics, McGraw Hill
2. Sedra A.S. & Smith K.C., Microelectronic Circuits, Oxford University Press

Sessional work assessment

Assignments	2x10=20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EC2K 403 : SIGNALS & SYSTEMS

(common with A12K 403, IC2K 403)
3 hours lecture & 1 hour tutorial per week

Module I (12 hours)
Introduction to signals and systems - classification of signals - basic operations on signals - elementary signals - concept of system - properties of systems - stability, invertability, time invariance - linearity - causality - memory - time domain description -convolution - impulse response - representation of LTI systems - differential equation and difference equation representations of LTI systems

Module II (15 hours)
Fourier representation of continuous time signals - Fourier transform - existence of the Fourier integral - FT theorems - energy spectral density and power spectral density -frequency response of LTI systems - correlation theory of deterministic signals - condition for distortionless transmission through an LTI system - transmission of a rectangular pulse through an ideal low pass filler - Hilbert transform - sampling and reconstruction

Module III (13 hours)
Fourier representation of discrete time signals - discrete Fourier series and discrete Fourier transform - Laplace transform analysis of systems - relation between the transfer function and differential equation - causality and stability - inverse system - determining the frequency response from poles and zeros

Module IV (12 hours)
Z transform - definition - properties of the region of convergence - properties of the Z transform - analysis of LTI systems - relating the transfer function and difference equation - stability and causality - inverse systems - determining the frequency response from poles and zeros

Text books

1. Haykin S. & Veen B.V., Signals & Systems, John Wiley
2. Oppenheim A.V.. Willskv A.S. & Nawab S.H,. Signals and Systems, Tata McGraw Hill (PHI)
3. Taylor F.H., Principles q/'Signals & Systems, McGraw Hill

Reference books

1. Lathi B.P., Modern Digital & Analog Communication Systems, Oxford University Press
2. Haykin S., Communication Systems, John Wiley
3. Bracewell R.N., Fourier Transform & Its Applications, McGraw Hill
4. Papoulis A., Fourier Integral & Its Applications, McGraw Hill

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern
Q 1 - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one

Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one]

EC2K 404 : ELECTRONIC CIRCUITS

4 hours per week

Module I (13 hours)

BJT amplifiers: biasing - load line - bias stabilization - stability factor - bias compensation
- analyses and design of CC, CE and CB configurations - RC coupled and transformer coupled multistage amplifiers - high frequency response

Module II (13 hours)
FET amplifiers: biasing of JFET - self bias and fixed bias - biasing of MOSFETS
-feedback biasing and fixed biasing for enhancement and depletion mode MOSFETs
-analyses of common source - common drain and common gate amplifier configurations

Module III (13 hours)
Feedback - effect of feedback on amplifier performance - voltage shunt - voltage series -current series and current shunt feedback configurations - positive feedback and oscillators
- analysis of RC phase shift, wein bridge, Colpitts, Hartley and crystal oscillators
-stabilization of oscillations

Module IV (13 hours)
Power amplifiers - class A, B, AB, C, D & S power amplifiers - harmonic distortion -efficiency - wide band amplifiers - broad banding techniques - low frequency and high frequency compensation - cascade amplifier - broadbanding using inductive loads

Text books

1. Millman & Halkias, Integrated Electronics, McGraw Hill
2. Sedra A.S & Smith K.C., Microelectronic Circuits, Oxford University Press
3. Boylestad R. & Nashelsky L.. Electronic Devices & Circuit Theory, Prentice Hall of India

Reference books

1. Hayt W.H., Electronic Circuit Analysis & Design, Jaico Pub.
2. Bogart T.F., Electronic Devices & Circuits', McGraw Hill
3. Horcnstein M.N., Microelectronic Circuits & Devices', Prentice Hall of India
3. Schilling D.L. & Belove C., 'Electronic Circuits', McGraw Hill
4. Baker R.J., Li H.W & Boyce D.E., CMOS - Circuit Design, Layout & Simulation, Prentice Hall of India

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q 1 -8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EC2K 405 : MICROPROCESSORS & MICROCONTROLLERS

(common with AI2K 405)

3 hours lecture & 1 hour tutorial per week

Module I (15 hours)

Intel 8086 processor - architecture - memory addressing - addressing modes - instruction set - assembly language programming - assemblers - interrupts - pin configuration -timing diagrams - minimum and maximum mode - multiprocessor configuration

Module II (12 hours)
Interfacing - address decoding - interfacing chips - programmable peripheral interface (8255) - programmable communication interface (8251) - programmable timer (8253) -DMA controller (8259) - programmable interrupt controller (8257) - keyboard display interface (8279)

Module III (12 hours)
Introduction to 80386 - memory management unit - descriptors, selectors, description tables and TSS - real and protected mode - memory paging - special features of the pentium processor - branch prediction logic - superscalar architecture

Module IV (13 hours)
Intel 80196 microcontroller - CPU operation - memory space - software overview -peripheral overview - interrupts - PWM timers - high speed inputs and outputs - serial port - special modes of operation

Text books

1. Hall D.V., Microprocessors & Interfacing, McGraw Hill
2. Brey B.B., The Intel Microprocessors - Architecture, Programming & Interfacing, Prentice Hall
3. Liu Y.C. & Gibson G. A., Microcomputer System: The 8086/8088 Family, Prentice Hall of India
4. Hintz K.J. & Tabak D., Microcontrollers-Architecture, Implementation & Programming, McGraw Hill

Reference books

1. Intel Data Book Vol. 1, Embedded Microcontrollers and Processors
2. Tribel W.A. & Singh A., The 8088 and 8086 Microprocessors, McGraw Hill
3. Mohammed R., Microprocessors & Microcomputer Based System Design, Universal Bookstall
4. Intel Data Book EBK 6496 16 bit Embedded Controller Handbook
5. Intel Data Book, EBK 6485 Embedded Microcontrollers Data Book
6. Intel Data Book, EBK 6486 Embedded Applications Book

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one Q III - 2 questions A and B of 15 marks from module II with choice to answer any one QIV - 2 questions A and B of 15 marks from module III with choice to answer any one Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EC2K 406 : ELECTRONIC INSTRUMENTATION

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Basic concept of measurements - accuracy - precision - error - linearity voltage and current measurements - basic principles of electronic voltmeters - ammeters - principles of digital multimeters

Module II (13 hours)
Transducers - principles of piezo electric - photo electric - thermo electric and magneto electric type transducers - strain gage - thermistor - pressure and flow transducers typical instrumentation system

Module II (13 hours)
Principles and applications of digital storage oscilloscope - spectrum analyser- 1C tester - synthesized signal generator - electronic LCR meter - Power meter - Q meter

Module IV (13 hours)
Frequency and time measurements - digital frequency and time interval counters -principles and applications - microprocessor based Instrumentation - temperature control system - data acquisition system - logic analyser

Text book

Oliver B.M. & Cage, Electronic Measurements & Instrumentation, Tata McGraw Hill.

Reference books

1. Cooper W., Electronic Instrumentation & Measurement Technique, Prentice Hall of India
2. Sonde B.S., Transducers & Display Systems. Tata McGraw Hill
3. Rangan C.S. et al, Instrumentation, Tata McGraw Hill

Sessional work assessment

Assignments	2x 10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I -8 short type questions of 5 marks, 2 from each module
Q II -2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V -2 questions A and B of 15 marks from module IV with choice to answer any one

EC2K 407(P); ELECTRONIC CIRCUITS LAB

[Common with AI2K 407(P)]

3 hours practicals per week

1. Feed back voltage regulator with short circuit protection
2. Voltage regulation with Zener diode and pass transistor
3. Emitter follower with & without complementary transistors - frequency and phase response for a capacitive load
4. Phase shift oscillator using BJT/FET
5. Hartley / Colpitts oscillator using BJT/FET
6. Power amplifier - Class A
7. Power amplifier - Class AB
8. Cascade amplifier - frequency response
9. 2 stage RC coupled amplifier - frequency response
10. Active load MOS amplifier
11. Wide band single BJT/MOS voltage amplifier with inductance
12. Single BJT crystal oscillator
13. Narrow band, high gain tuned amplifier

Sessional work assessment

Lab practicals & record		= 30
2 tests	2x10	=20
Total marks		= 50

EC2K 408(P) : DIGITAL ELECTRONICS LAB

[Common with AI2K 408(P), IC2K 408(P)
3 hours practicals per week

List of experiments

1. Feed back voltage regulator with short circuit protection
2. Voltage regulation with Zener diode and pass transistor
3. Emitter follower with & without complementary transistors - Frequency and phase response for a capacitive load
4. Phase shift oscillator using BJT/FET
5. Hartley / Colpitts oscillator using BJT/FET
6. Power amplifier - Class A
7. Power amplifier-Class AB
8. Cascade amplifier - Frequency response
9. 2 stage RC coupled amplifier - Frequency response
10. Active load MOS amplifier
11. Wide band single BJT/MOS voltage amplifier with inductance
12. Single BJT crystal oscillator
13. Narrow band, high gain tuned amplifier

Sessional work assessment

Lab practicals & record = 30
2 tests 2x10 =20
Total marks = 50

EC2K 408(P): DIGITAL ELECTRONICS LAB

(Common with AI2K 408(P), IC2K 408(P)

3 hours practicals per week

List of experiments:

1. Characteristics of TTL gates
2. Code converters using basic gates
3. Combinational Logic design using decoders and MUXs
4. Half and full adders and subtractors
5. 4 bit adder- subtractor 1C & BCD adder circuit
6. Flip flop circuit (RS latch, JK & master slave) using basic gates
7. Ripple, Johnson & Ring counters
8. Synchronous counters
9. A sequence detector circuit
10. Interfacing & addressing memory chips
11. ADC circuits (counter ramp & dual slope) & Ics
12. DAC circuits (binary & weighted resistor) & Ics

Sessional work assessment

Lab practicals & record = 30
2 tests 2x10 = 20
Total marks = 50

FIFTH SEMESTER

Code	Subject	Hours/Week			Sessional	University Examination	
		L	T	P/D		Hrs	Marks
EC2K 501	Software Engineering	3	1	-	50	3	100
EC2K 502	Electromagnetic Field Theory	3	1	-	50	3	100
EC2K 503	Analog Communications	3	1	-	50	3	100
EC2K 504	Linear Integrated Circuits	3	1	-	50	3	100
EC2K 505	Computer Organization & Architecture	3	1	-	50	3	100
EC2K 506	Elective I	3	1	-	50	3	100
EC2K 507(P)	**Micro Processors & Micro Controllers Lab**	-	-	3	50	3	100
EC2K 508(P)	**Linear Integrated Circuits Lab**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

Elective I

EC2K 506A - Numerical Analysis

EC2K 506B - Power Electronics

EC2K 506C - Digital MOS Circuits

EC2K 506D - Digital System Design

EC2K 506E - Object Oriented Programming

SIXTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
EC2K 601	Control Systems	3	1	-	50	3	100
EC2K 602	Radiation & Propogation	3	1	-	50	3	100
EC2K 603	Digital Communications	3	1	-	50	3	100
EC2K 604	Digital Signal Processing	3	1	-	50	3	100
EC2K 605	Mechanical Engineering	3	1	-	50	3	100
EC2K 606	Elective II	3	1	-	50	3	100
EC2K 607(P)	**Analog Communication Lab**	-	-	3	50	3	100

EC2K 608(P)	**Mini Project (Hardware)**	-	-	3	50	-	-
TOTAL		**18**	**6**	**6**	**400**	**-**	**700**

Elective II

EC2K 606A - Optimisation Techniques
EC2K 606B - High Speed Digital Design
EC2K 606C - Data Structures & Algorithms
EC2K 606D - Analog MOS
EC2K 606E - Linear System Analysis
EC2K 606F - Introduction to Social Sciences

SEVENTH SEMESTER

Code	**Subject**	**Hours/Week**			**Sessional Marks**	**University Examination**	
		L	**T**	**P/D**		**Hrs**	**Marks**
EC2K 701	Industrial Management	3	1	-	50	3	100
EC2K 702	Microwave Devices & Communication	3	1	-	50	3	100
EC2K 703	Information Theory & Coding	3	1	-	50	3	100
EC2K 704	Computer Communication & Networking	3	1	-	50	3	100
EC2K 705	Elective III	3	1	-	50	3	100
EC2K 706(P)	**Digital Communication Lab**	-	-	3	50	3	100
EC2K 707(P)	**Seminar**	-	-	3	50	-	-
EC2K 708(P)	**Project**	-	-	4	50	-	-
TOTAL		**15**	**5**	**10**	**400**	**-**	**600**

Elective III

EC2K 705A - Biomedical Instrumentation
EC2K 705B - Industrial Psychology
EC2K 705C - Artificial Intelligence & Expert System
EC2K 705D - DSP Processors
EC2K 705E - Television Engineering & Radar Systems
EC2K 705F - Entrepreneurship
EC2K 705G - Wavelets

EIGHTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
EC2K 801	Economics	3	1	-	50	3	100
EC2K 802	Optical Communication	3	1	-	50	3	100
EC2K 803	Microelectronics Technology	3	1	-	50	3	100
EC2K 804	Communication Switching Systems	3	1	-	50	3	100
EC2K 805	Elective IV	3	1	-	50	3	100
EC2K 806(P)	**Advanced Communication Engineering Lab**	-	-	3	50	3	100
EC2K 807(P)	**Project**	-	-	7	100	-	-
EC2K 808(P)	**Viva Voce**	-	-	-	-	-	100
TOTAL **Aggregate marks for 8 semesters = 8300**		**15**	**5**	**10**	**400** **3000**	**-**	**700** **5300**

Elective IV

EC2K 805A - Wireless Mobile Communication
EC2K 805B - Internet Technologies
EC2K 805C - Neural Networks & Fuzzy Logic
EC2K 805D - Image Processing
EC2K 805E - Satellite Communication Systems
EC2K 805F - Electronic Commerce
EC2K 805G - Speech Processing

EC2K 502 : ELECTROMAGNETIC FIELD THEORY

3 hours lecture and 1 hour tutorial per week

Module I: The electric field (12 hours)

Co-ordinate transformations - vector fields - divergence theorem - stokes theorem - static electric field - electric flux - gauss's law - electric scalar potential - electric dipole - field polarization in dielectrics - electrostatic boundary conditions - Laplace's and Poisson's equations - method of images - capacitance - capacitance of isolated sphere - capacitance between coaxial cylinders - capacitance between parallel wires - energy stored in electric field

Module II: The magnetic field (12 hours)

Steady current and current density in a conductor - steady magnetic field - Biot Savart's law and ampere's law - scalar and vector magnetic potentials - magnetic boundary conditions - magnetic torque and moment - magnetic dipole - magnetisation in materials - inductance - self and mutual inductance - inductance of solenoids, toroids and transmission lines - energy stored in magnetic field - Faraday's law of electromagnetic induction - motional and transformer emf

Module III: Maxwell's equations (14 hours)

Current continuity equation - displacement current - dielectric hysterisis - Maxwell's equations - wave and wave equations - solutions for free space conditions - uniform plane wave - sinusoidal time variations - Poynting's vector and Poynting's theorem - wave equations for conducting medium - wave polarization

Module IV: Wave propagation & transmission lines (14 hours)

Propagation of waves through conductors and dielectrics - wave incidence normally and obliquely on a perfect conductor - wave incidence on the surface of a perfect dielectric - brewster angle - transmission lines - wave equations on transmission lines - phase velocity and group velocity - characteristic impedance - standing wave ratio - impedance matching - smith chart

Text & reference books

1. Kraus J.D., *Electromagnetics*, McGraw Hill
2. Mattew N.O., Sadiku, *Elements of Electromagnetics*, Addison Wesley
3. Cheng D.K., *Field and Wave Electromagnetics*, Addison Wesley
4. Hayt W.H., *Engineering Electromagnetics*, McGraw Hill, Kogakusha
5. Guru & Hiziroglu, *Electromagnetic Field Theory Fundamentals*
6. Premlet B., *Electromagnetic Theory with Applications*, Phasor Books

Sessional work assessment

Two tests	2 x 15 = 30
Two assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 503 : ANALOG COMMUNICATIONS

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Random process: review of the theory of continuous random variables - joint distribution and density functions - conditional distribution functions - random process - ensemble average - stationarity - wide sense stationarity - time averages - ergodicity - correlation theory for WSS random process - power spectral density - Wiener - Khinchie Eiestein theorem - response of LTI systems to random process - guassian random process - filtered guassian random process - white guassian noise

Module II (10 hours)

Noise: sources of noise - thermal noise - shot noise and flicker noise - filtered white noise - narrow band noise - quadrature representation - envelope and phase representation - signal to noise ratio - noise equivalent bandwidth - effective noise temperature - noise calculations for cascaded stages

Module III (15 hours)

Amplitude modulation: spectrum of amplitude modulated signal - power relations - AM generation and detection - DSB-SC generation and detection - SSB-SC generation and detection - VSB modulation - AM transmitter and receiver - TRF and superheterodyne receivers - noise analysis of AM receivers - ANR for envelope detection and coherent detection - SNR in DSB-SC and SSB-SC systems

Module IV (15 hours)

Frequency modulation: angle modulation - frequency modulation - narrow band FM - wide band FM - transmission bandwidth - generation of FM signals - direct and indirect methods - FM demodulators - noise in FM reception - threshold effect - pre-emphasis and de-emphasis

Text books

1. Simon Haykin, "*Communication Systems*", John Wiley
2. Ziemer R.E. & Tranter W.H., "*Principles of Communication*", JAICOP Publishing House
3. Dennis Roddy, John Coolen, "*Electronic Communications*", PHI

Reference books

1. Sam Shanmugam K., "*Digital and Analog Communication Systems*", John Wiley
2. Yannic Viniotis, "*Probability for Electrical Engineers*", McGraw Hill International

3. Lathi B.P., "*Modern Digital and Analog Communication Systems*", Oxford University Press.
4. Tomasi, *Electronic Communication: Fundamentals Through Advanced*, Pearson Education
5. Couch, *Digital and Analog Communication Systems*, Pearson Education

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 504 : LINEAR INTEGRATED CIRCUITS

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

BJT differential amplifier analysis - concept of CMRR - methods to improve CMRR - constant current source - active load - current mirror - Darlington pair - differential input impedance - various stages of an operational amplifier - simplified schematic circuit of op-amp 741 - need for compensation - lead, lag and lead lag compensation schemes - typical op-amp parameters - slew rate - power supply rejection ratio - open loop gain - unity gain bandwidth - offset current & offset voltage

Module II (12 hours)

MOS differential amplifier - source coupled pair - source cross coupled pair - current source load and cascode loads - wide swing current differential amplifier - wide swing constant transconductance differential amplifier - CMOS opamp with and without compensation - cascode input opamp - typical CMOS opamp parameters

Module III (11 hours)

Linear opamp circuits - inverting and noninverting configurations - analysis for closed loop gain - input and output impedances - virtual short concept - current to voltage and voltage to current converters - instrumentation amplifier - nonlinear opamp circuits - log and antilog amplifiers - 4 quadrant multipliers and dividers - phase shift and wein bridge oscillators - comparators - astable and monostable circuits - linear sweep circuits

Module IV (16 hours*)*

Butterworth, Chebychev and Bessel approximations to ideal low pass filter characteristics - frequency transformations to obtain HPF, BPF and BEF from normalized prototype LPF - active biquad filters - LPF & HPF using Sallen-Key configuration - BPF realization

using the delyannis configuration - BEF using twin T configuration - all pass filter (first & second orders) realizations - inductance simulation using Antoniou's gyrator

Text books

1. Jacob Baker R., Li H.W. & Boyce D.E., '*CMOS- Circuit Design, Layout & Simulation*', PHI
2. Sergio Franco, '*Design with Operational Amplifiers and Analog Integrated Circuits*', McGraw Hill Book Company
3. Fiore J.M., '*Operational Amplifiers and Linear Integrated Circuits*', Jaico Publishing House
4. Gaykward, *Operational Amplifiers*, Pearson Education

Reference books

1. Gobind Daryanani, '*Principles of Active Network Synthesis & Design*', John Wiley
2. Sedra A.S. & Smith K.C., "*Microelectronic Circuits*', Oxford University Press
3. Coughlin R.F. & Driscoll F.F., '*Operational Amplifiers and Linear Integrated Circuits*', Pearson Education
4. Horenstein M.N., '*Microelectronic Circuits & Devices',* PHI

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 505 : COMPUTER ORGANISATION & ARCHITECTURE

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Evolution of computer systems - different types of computer systems and their interfaces - complexity of computing - design of a computer system - RTL, schematic and logic circuit level structure - central processing unit - data path and control path - execution of instruction - ALU - arithmetic processor - interrupt cycle

Module II (13 hours)

Controller and memory design - control transfer - fetch cycle - instruction interpretation sand control - hardwired control - microprogrammed control - memory subsystems - CPU memory interaction - memory array organization and technology - speed mismatch problem - multiple module memory - associative and virtual memory

Module III (13 hours)

Secondary storage and I/O processing - magnetic medium and magnetic head - digital recording methods - magnetic tape drive and controller - disk drive and controller - I/O data transfer techniques - bas interface - I/O accessing and data transfer - I/O interrupt - I/O channel processor

Module IV (13 hours)

Computer system architecture - performance and cost - instruction set architecture - microarchitecture - architecture of memory subsystem - I/O subsystem architecture (SCSI, ISA, PCA and MCA bus) - parallel processing system architecture - (pipeline hazards - SIMD and MIMD systems - crossbar and multiple interconnection networks)

Text books

1. Pal Choudhuri P., "*Computer Organization and Design*", PHI
2. Patterson D.A. & Hennessy J.L., "*Computer Organization and Design*", Morgan Kaufmann Publishers
3. William Stallings, "*Computer Organization and Architecture*", Pearson Education

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 506A : NUMERICAL ANALYSIS

(common for AI2K/CE2K/CH2K/EE2K/IC2K/ME2K/PM2K 506A)

3 hours lecture and 1 hour tutorial per week

Module I: Errors in numerical calculations (13 hours)

Sources of errors, significant digits and numerical instability - numerical solution of polynomial and transcendental equations - bisection method - method of false position - Newton-Raphson method - fixed-point iteration - rate of convergence of these methods - iteration based on second degree equation - the Muller's method - Chebyshev method - Graeffe's root squaring method for polynomial equations - Bairstow's method for quadratic factors in the case of polynomial equations

Module II: Solutions of system of linear algebraic equations (13 hours)

Direct methods - gauss and gauss - Jordan methods - Crout's reduction method - error analysis - iterative methods - Jacobi's iteration - Gauss-seidel iteration - the relaxation method - convergence analysis - solution of system of nonlinear equations by Newton-Raphson method - power method for the determination of eigen values - convergence of power method

Module III: Polynomial interpolation (13 hours)

Lagrange's interpolation polynomial - divided differences Newton's divided difference interpolation polynomial - error of interpolation - finite difference operators - Gregory - Newton forward and backward interpolations - Stirling's interpolation formula - interpolation with a cubic spline - numerical differentiation - differential formulas in the case of equally spaced points - numerical integration - trapezoidal and Simpson's rules - Gaussian integration - errors of integration formulas

Module IV: Numerical solution of ordinary differential equations (13 hours)

The Taylor series method - Euler and modified Euler methods - Runge-Kutta methods (2^{nd} order and 4^{th} order only) - multistep methods - Milne's predictor - corrector formulas - adam-bashforth & adam-moulton formulas - solution of boundary value problems in ordinary differential equations - finite difference methods for solving two dimensional Laplace's equation for a rectangular region - finite difference method of solving heat equation and wave equation with given initial and boundary conditions

Reference books

1. Froberg C.E., *Introduction to Numerical Analysis*, Addison Wesley
2. Gerald C.F., *Applied Numerical Analysis*, Addison Wesley
3. Hildebrand F.B., *Introduction to Numerical Analysis*, T.M.H.
4. James M.L., Smith C.M. & Wolford J.C., *Applied Numerical Methods for Digital Computation*, Harper & Row
5. Mathew J.H., *Numerical Methods for Mathematics, Science and Engineering*, P.H.I.

Sessional work assessment

Assignments	2×10=20
2 tests	2×15=30
Total marks	=50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module

Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks each from module II with choice to answer any one.

Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one.

EC2K 506B : POWER ELECTRONICS

(common with AI2K 506B)

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Power diodes - basic structure and V-I characteristics - various types - power transistors - BJT, MOSFET and IGBT - basic structure and V-I characteristics - thyristors - basic structure - static and dynamic characteristics - device specifications and ratings - methods of turning on - gate triggering circuit using UJT - methods of turning off - commutation circuits - TRIAC

Module II (13 hours)

Line frequency phase controlled rectifiers using SCR - single phase rectifier with R and RL loads - half controlled and fully controlled converters with continuous and constant currents - SCR inverters - circuits for single phase inverters - series, parallel and bridge inverters - pulse width modulated inverters - basic circuit operation

Module III (12 hours)

AC regulators - single phase ac regulator with R and RL loads - sequence control of ac regulators - cycloconverter - basic principle of operation - single phase to single phase cycloconverter - choppers - principle of operation - step-up and step-down choppers - speed control of DC motors and induction motors

Module IV (14 hours)

Switching regulators - buck regulators - boost regulators - buck-boost regulators - cuk regulators - switched mode power supply - principle of operation and analysis - comparison with linear power supply - uninterruptible power supply - basic circuit operation - different configurations - characteristics and applications

Text/Reference books

1. Ned Mohan et. al., *Power Electronics*, John Wiley
2. Sen P.C., *Power Electronics*, Tata McGraw Hill
3. Dubey et. al. G.K., *Thyristorised Power Controllers,* Wiley Eastern Ltd.
4. Dewan & Straughen, *Power Semiconductor Circuits*, John Wiley
5. Singh M.D. & Khanchandani K.B., *Power Electronics*, Tata McGraw Hill
6. Lander C.W., *Power Electronics*, McGraw Hill
7. Sen P.C., *Modern Power Electronics*, Wheeler Publishers
8. Agarwal, *Power Electronics*

Sessional work assessment

Two tests	2 x 15 = 30
Two assignments:	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module

Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 506C : DIGITAL MOS CIRCUITS

3 hours lecture and 1 hour tutorial per week

Module I (11 hours)

Short and narrow channel effects in MOS transistor (MOST) - subthrehold current - channel length modulation - drain induced barrier lowering - hot electron effects - velocity saturation of charge carriers

Scaling of MOST - constant voltage and constant field scaling - digital MOSFET model - series connection of MOSFETs

Module II (15 hours)

MOS inverters - resistive load - NMOS load - pseudo NMOS and CMOS inverters - calculation of input high and low and output high and low levels - power dissipation - calculation of delay times for CMOS inverter - CMOS ring oscillator - design of super buffer - estimation of interconnect parasitics and calculation of interconnect delay

Module III (13 hours)

MOS logic circuits - CMOS NOR, NAND, AOI and OAI gates - full adder - SR and JK latches - C^2MOS latch - transmission gates - simple circuits using TG - basic principles of pass transistor logic - voltage boot strapping - BiCMOS logic circuits - BiCMOS inverter with resistive base pull down and active base pull down - BiCMOS switching transients - simple gates using BiCMOS

Module IV (13 hours)

Dynamic CMOS logic - precharge/evaluate logic - cascading problem - domino logic - cascading domino logic gates - charge sharing in domino logic - solutions to charge sharing problem - realisation of simple functions using domino logic - NORA logic - true single phase clock dynamic logic - basic ideas of adiabatic logic

Reference books

1. Sung-Mo Kang & Yusuf Leblebici, *CMOS Digital Integrated Circuits - Analysis & Design*, MGH
2. Jacob Baker R., Li H.W. & Boyce D.E., *CMOS - Circuit Design, Layout & Simulation*, PHI
3. Ken Martin, *Digital Integrated Circuit Design*, Oxford Univ. Press
4. Rabaey J.M., *Digital Integrated Circuits - A Design Perspective*, Prentice Hall
5. Yuan Taur & Ning T.H., *Fundamentals of Modern VLSI Devices*, Cambridge Univ. Press

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 506D : DIGITAL SYSTEM DESIGN

(common with AI2K/IC2K 506D)

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Review of logic design: logic design issues - hazards in combinational networks - hazards in sequential networks - synchronous design method - clock skew - asynchronous inputs - synchroniser failure and metastability

Module II (14 hours)

Hardware description languages: introduction to VHDL - behavioral modeling - transport Vs inertial delay - simulation deltas - sequential processing - process statement - signal assignment Vs variable assignment - sequential statements - data types - subprograms and packages - predefined attributes - configurations - subprogram overloading - VHDL synthesis - design examples

Module III (13 hours)

Designing with programmable devices: programmable LSI techniques - programmable logic arrays - programmable array logic - sequential PLDs - sequential circuit design using PLDs - complex programmable logic devices and filed programmable gate arrays - altera series FPGAs and Xilinx series FPGAs (typical internal structure)

Module IV (13 hours)

Design issues for testability: design for testability - bed of nails and in-circuit testing - scan methods - testing combinational circuits - testing sequential circuits - boundary scan - built-in self test - estimating system reliability - transmission line reflections and termination

Text books

1. Roth C.H. Jr., "*Digital System Design Using VHDL*", PWS Pub. Co.
2. Wakerly J.F., "*Digital Design: Principles and Practices"*, PHI Inc.
3. Katz R.H., "*Contemporary Logic Design"*, Benjamin/Cummings Publishing Co.
4. Bostock G., "*FPGAs and Programmable LSI*", Butterworth Heinemann
5. Perry D.L., "*VHDL"*, McGraw Hill

Reference books

1. Lewin D. & Protheroe D., "*Design of Logic Systems*", Chapman & Hall
2. Zoran Salacic, "*Digital System Design and Prototyping Using Field Programmable Logic*", Kluwer Academic Publishers
3. Stephen Brown & Zvonoko Vranesic, "*Fundamentals of Digital Logic with VHDL Design*", McGraw Hill
4. Bhasker J., "*A VHDL Primer*", Addison Wesley
5. Navabi Z., "*VHDL: Analysis and Modeling of Digital Systems*", McGraw Hill
6. Palnikkar, *Verilog HDC,* Pearson Education

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 506E : OBJECT ORIENTED PROGRAMMING

(common for all programmes)

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

OOPS and Java basics - Java virtual machine - Java platform API - extended security model - applet classes - exceptions and abstract classes - Java applet writing basics - GUI building with canvas - applet security - creating window applications - writing console applications - utility and math packages

Module II (10 hours)

Swing programming - working with swing components - using the clipboard - input/output streams - printing - working with 2D and 3D Graphics - using audio and video - creating animations

Module III (10 hours)

Java beans development kit - developing beans - notable beans - network programming - client and server Programs - naming and directory services - working with Java management APIS

Module IV (20 hours)

Distributed application architecture - CORBA - RMI and distributed applications - working with remote objects - object serialization and Javaspaces - Java IDL and ORBs, connecting to database - using JDBC - integrating database - support into web applications - Java servlets - JSDK - JAR files - Java native interface

Text books

1. Campione, Walrath & Huml Tutorial team, "*The Java Tutorial Continued: The Rest of the JDK*", Addison Wesley
2. Jamie Jaworski, "*Java 2 Platform Unleashed: The Comprehensive Solution*", SAMS Teachmedia

References books

1. Holzner S., *Java 2, Swings, Servlets, JDBC & Java Beans Programming*, IDG Books
2. Campione M. & Walrath K. "*The Java Tutorial: Object-Oriented Programming for the Internet*", Addison Wesley

3. Patrick N. & Schildt H., "*Java 2: The Complete Reference,* Tata McGraw Hill

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 507(P) : MICROPROCESSOR & MICROCONTROLLER LAB

3 hours practicals per week

List of experiments

1. 8068 kit familiarization and basic experiments
2. Addition and Subtraction of Binary and unpacked BCD numbers
3. Double precision multiplication
4. Multiplication of 16 byte ASCII string by single ASCII string
5. Sorting algorithms
6. Searching algorithms
7. Interfacing with A/D converters
8. Interfacing with D/A converters
9. PWM motor control circuits
10. Serial communication between two kits
11. General purpose clock design
12. Interfacing with PCs

Sessional work assessment	
Laboratory practicals and record	= 30
Test/s	= 20

Total marks	= 50

EC2K 508(P) : LINEAR INTEGRATED CIRCUITS LAB.

(common with AI2K/IC2K 508(P)

3 hours practicals per week

1. Measurement of op-amp parameters - CMRR, slew rate, open loop gain, input and output impedances
2. Inverting and non-inverting amplifiers, integrators and differentiators - frequency response
3. Instrumentation amplifier - gain, CMRR and input impedance
4. Single op-amp second order LFF and HPF - Sallen-Key configuration
5. Narrow band active BPF - Delyiannis configuration
6. Active notch filter realization using op-amps
7. Wein bridge oscillator with amplitude stabilization
8. Astable and monostable multivibrators using op-amps
9. Square, triangular and ramp generation using op-amps
10. Voltage regulation using IC 723
11. Astable and monostable multivibrators using IC 555
12. Design of PLL for given lock and capture ranges & frequency multiplication
13. Precision limiter using op-amps
14. Multipliers using op-amps - 1,2 & 4 quadrant multipliers

Sessional work assessment	
Laboratory practicals and record	= 30
Test/s	= 20
Total marks	= 50

EC2K 601 : CONTROL SYSTEMS

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

General schematic diagram of control systems - open loop and closed loop systems - concept of feedback - role of computers in automatic control - modeling of continuous time systems - laplace transform - properties - application in solution of differential equations - transfer function - block diagrams - signal flow graph - mason's gain formula - block diagram reduction using direct techniques and signal flow graphs - examples - derivation of transfer function of simple systems from physical relations - low pass RC filter - RLC series network - spring mass damper - DC servomotor for position and speed control - low pass active filter - definitions of poles, zeros, order and type

Module II (14 hours)

Analysis of continuous time systems - time domain solution of first order systems - time constant - time domain solution of second order systems - determination of response for standard inputs using transfer functions - steady state error - concept of stability - Routh-Hurwitz techniques - construction of bode diagrams - phase margin - gain margin - construction of root locus - polar plots and theory of nyquist criterion - theory of lag, - lead and lag-lead compensators

Module III (16 hours)

Modeling of discrete - time systems - sampling - mathematical derivations for sampling - sample and hold - Z-transforms-properties - solution of difference equations using Z - transforms - examples of sampled data systems - mapping between s plane and z plane - cyclic and multi-rate sampling (definitions only) - analysis of discrete time systems - pulse transfer function - examples - stability - Jury's criterion - bilinear transformation - stability analysis after bilinear transformation - Routh-Hurwitz techniques - construction of bode diagrams - phase margin - gain margin - digital redesign of continuous time systems

Module IV (10 hours)

State variable methods - introduction to the state variable concept - state space models - physical variable - phase variable and diagonal forms from time domain (up to third order only) - diagonalisation - solution of state equations - homogenous and non homogenous cases (up to second order only) - properties of state transition matrix - state space representation of discrete time systems - solution techniques - relation between transfer function and state space models for continuous and discrete cases-relation between poles and Eigen values

Reference books

1. Ziemer R.E., Tranter W.H. & Fannin D.R., "*Signals and Systems*", Pearson Education Asia
2. Ogata K., "*Modern Control Engineering*", Prentice Hall India
3. Dorf R.C. & Bishop R.H., "*Modern Control Systems*", Addison Wesley
4. Kuo B.C., "*Digital Control Systems*", Oxford University Press
5. Ogata K., "*Discrete Time Control Systems*", Pearson Education Asia
6. Nagarath I.J. & Gopal M., "*Control System Engineering*", Wiley Eastern Ltd.

Sessional work assessment

Two tests	2 x 15 = 30
Two assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 602 : RADIATION & PROPAGATION

3 hours lecture and 1 hour tutorial per week

Module I: Antenna fundamentals (13 hours)

Source of radiation - radiation from accelerated charges - oscillating electric dipole - power radiated by a current element - radiation from a half wave dipole - antenna field zones (analysis) - antenna parameters - patterns - beam area - radiation intensity - beam efficiency - directivity - gain - effective aperture - effective height - self impedance - mutual impedance - antenna theorems - reciprocity theorem - Babinet's principle

Module II: Antenna arrays (14 hours)

Linear antenna arrays - two element array of isotropic point sources - amplitude and phase characteristics - pattern multiplication - N-element array - analysis and design of broad - side array - end-fire array - binomial array and Dolph-Tchebyscheff array

Module III: Special antennas (13 hours)

Travelling wave antenna - long wire - V and rhombic antennas - broad band dipole - folded dipole antenna - broad band antennas - Yagi-Uda antenna and horn antenna - reflector antenna - parabolic reflector antenna - cassegrain antenna - frequency independent antenna - log periodic antenna microstrip antenna

Module IV: Radio wave propagation (12 hours)

Ground wave propagation - reflection from earth - space wave - surface wave - spherical earth propagation - tropospheric waves - ionospheric propagation - ionosphere - plasma oscillations - wave propagation in plasma - reflection and refraction of waves by the ionosphere - critical frequency - virtual height

Text books

1. Jordan & BALMAIN, *Electromagnetic Waves and Radiating Systems*, Prentice Hall of India
2. Kraus J.D., *Antenna Theory*, McGraw Hill
3. Balanis C.A., *Antennas*, McGraw Hill

Reference books

1. Collin R.E., *Antennas & Radio Wave Propagation*, McGraw Hill
2. Ramo & Whinnery, *Fields & Waves in Communication Electronics*, John Wiely

Sessional work assessment

Two tests	2x15	= 30
Two assignments	2x10	= 20
Total marks		= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one

Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 603 : DIGITAL COMMUNICATIONS

3 hours lecture and 1 hour tutorial per week

Module I (10 hours)
Analog pulse modulation - sampling theorem for bandpass signals - pulse amplitude modulation - generation and demodulation - PAM/TDM system - PPM generation and demodulation - PWM - spectra of pulse modulated signals - SNR calculations for pulse modulation systems - waveform coding - quantization - PCM - DPCM - delta modulation - adaptive delta modulation - line coding schemes - ON-OFF, NRZ, Bipolar - Manchester signaling and differential encoding

Module II (12 hours)
Shaping - nyquist criterion for zero ISI - signalling with duobinary pulses - eye diagram - equalizer, scrambling and descrambling - signal space concepts - geometric structure of the signal space - L^2 space - distance, norm and inner product - orthogonality - gram-base band data transmission - matched filter receiver - inter symbol interference – Gram - schmidt orthogonalization procedure

Module III (15 hours)
Review of Gaussian random process - optimum threshold detection - optimum receiver for AWGN channel - matched filter and correlation receivers - decision procedure - maximum a-posteriori probability detector - maximum likelihood detector - probability of error - bit error rate - optimum receiver for coloured noise - carrier and symbol synchronization

Module IV (15 hours)
Digital modulation schemes - coherent binary schemes - ASK, FSK, PSK, MSK coherent M-ary schemes - calculation of average probability of error for different modulation schemes - power spectra of digitally modulated signals - performance comparison of different digital modulation schemes

Text books

1. Simon Haykin, *Communication Systems*, John Wiley
2. Lathi B.P., *Modern Digital and Analog Communication*, Oxford University Press
3. Sklar, *Digital Communication*, Pearson Education

References books

1. Sam Shanmugham K., *Digital and Analog Communication Systems*, John Wiley
2. Ziemer R.E. & Tranter W.H., *Principles of Communications*, JAICO Publishing House
3. Taub H. & Schilling, *Principles of Communication Systems,* TMH
4. Proakis J.G., *Digital Communications*, McGraw Hill
5. Pierre Lafrance, *Fundamental Concepts in Communication,* Prentice Hall India
6. Couch, *Analog and Digital Communication*

Sessional work assessment

Two tests 2 x 15 = 30
Two assignments 2 x 10 = 20
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 604 : DIGITAL SIGNAL PROCESSING

(common with AI2K/IC2K 604)

3 hours lecture and 1 hour tutorial per week

Module I: Discrete Fourier transform (12 hours)

Discrete Fourier series - properties of DFS - periodic convolution - DFT - properties - linear convolution using DFT - computation of DFT - circular convolution - decimation in time and decimation in frequency algorithms - FFT algorithm for a composite number

Module II (14 hours)

Signal flow graph representation - basic filter structures - structures for linear phase - finite word - length effects in digital filters - quantizer characteristics - saturation overflow - quantization in implementing systems - zero Input limit cycles

Module III: Digital filter design (14 hours)

Design of IIR digital filters from analog filters - Butterworth and Chebyshev filters - design examples -impulse invariant and bilinear transformation methods - spectral transformation of IIR filters - FIR filter design - linear phase characteristics - window method

Module IV: General and special purpose hardware for DSP (12 hours)

Computer architecture for signal processing - hardware architecture - pipelining - hardware multiplier - accumulator - special instructions - general purpose digital signal processors - texas instruments - TMS 320 family - motorola DSP 56000 family - analog devices ADSP 2100 family - implementation of DSP algorithm on general purpose digital signal processors

Reference books

1. Oppenheim A.V., Schafer R.W. & Buck J.R., *Discrete - Time Signal Processing,* Prentice Hall Signal Processing Series, Pearson Education
2. Mitra S.K., *Digital Signal Processing: A Computer Based Approach,* Tata McGraw Hill

3. Proakis T.G. & Manolakkis D.G., *Digital Signal Processing - Principles, Algorithms and Applications,* Prentice Hall of India Pvt. Ltd.
4. Ludeman L.C., *Fundamentals of Digital Signal Processing*, Harper & Row Publishers
5. Terrel T.J. & Shark L.K., *Digital Signal Processing,* Macmillan
6. Ifeacher E.C. & Jervis B.W., *Digital Signal Processing, A Practical Approach,* Addison Wesley
7. Phi Lapseley, Jeff Bier, Amit Shohan & Lee E.A., "*DSP Processor Fundamentals-Architectures and Features*", IEEE Press

Sessional work assessment

Two tests 2 x 15 = 30
Two assignments 2 x 10 = 20
Total marks = 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 605 : MECHANICAL ENGINEERING

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Thermodynamics - thermodynamics systems - thermodynamic properties and processes - heat and work - equation of state - properties of ideal gases - properties of pure substances Zeroth law of thermodynamics - temperature scales - first law of thermodynamic - heat, work and energy of closed and open systems - concept of internal energy - enthalpy - second law of thermodynamics - concept of entropy - availability of work and energy

Module II (13 hours)

Engineering applications of thermodynamics - air cycles - carnot cycle - otto and diesel cycles - principle of operation of 2 stroke and 4 stroke engines vapour power cycles - Mollier diagram - ranking cycle

Module III (13 hours)

Head transfer - basic modes of heat transfer - conduction, convection and radiation - conduction - Fourier law of conduction - general conduction equation - convection - forced and free convection - heat transfer relations - radiation - laws of radiation - concepts of black body

Module IV (13 hours)

Fluid mechanics - laws of fluid motion, continuity, momentum and energy equations - Bernoulli's equation and its application to flow and velocity measuring devices - capillary flow and viscous flow

Text books

1. Rajendra Prakash & Gupta, *Engineering Thermodynamics*
2. Holman J.P., *Heat Transfer*, McGraw Hill

Reference books

1. Michael saad, *Thermodynamics for Engineers*, Prentice Hall
2. Spalding & Cole, *Engineering Thermodynamics,* Edward Arnold

Sessional work assessment

2 Tests	2x15 = 30
2 assignments	2x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 606A : OPTIMIZATION TECHNIQUES

(common with AI2K/CE2K/EE2K/IC2K/ME2K/PM2K 606A)

3 hours lecture and 1 hour tutorial per week

Module I: Linear programming I (13 hours)

Systems of linear equations and inequalities - convex sets - convex functions - formulation of linear programming problems - theory of simplex method - simplex algorithm - Charne's M method - two phase method - duality in linear programming - dual simplex method

Module II: Linear programming II (13 hours)

Sensitivity analysis - parametric programming - bounded variable problems - transportation problem - development of the method - integrality property - degeneracy - unbalanced problems - assignment problem - development of the Hungarian method - routing problems

Module III: Nonlinear programming (13 hours)

Mathematical preliminaries of non-linear programming - gradient and Hessian - unimodal functions - convex and concave functions - role of convexity - unconstrained optimization - fibonacci search - golden section search - optimal gradient method - classical optimization - Lagrange multiplier method - Kuhn-tucker conditions - quadratic programming - separable convex programming - frank and wolfe method

Module IV: Dynamic programming & game theory (13 hours)

Nature of dynamic programming problem - Bellman's optimality principle - cargo loading problem - replacement problems - multistage production planning and allocation problems - rectangular games - two person zero sum games - pure and mixed strategies - 2×m and m×2 games - relation between theory of games and linear programming

Reference books

1. Bazarra M.S., Jarvis J.J. & Sherali H.D. '*Linear Programming and Network Problems*', John Wiley
2. Bazarra M.S., Sherali H.D. & Shetty C.M., *'Nonlinear Programming, Theory and Algorithms',* John Wiley
3. Hadley G., '*Linear Programming*', Addison Wesley, Narosa
4. Hillier F.S. & Lieberman G.J. *'Introduction to Operations Research'*, McGraw Hill
5. Ravindran A., Phillips D.T. & Solberg J. J., *Operations Research Principles and Practice*, John Wiley
6. Taha H.A., *Operations Research, An introduction*, P.H.I.
7. Wagner H.M., '*Principles of Operations Research with Application to Managerial Decisions'*, P.H.I.

Sessional work assessment

Assignments	2×10=20
2 tests	2×15=30
Total marks	=50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one.
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one.
Q IV - 2 questions A and B of 15 marks each from module II with choice to answer any one.
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one.

EC2K 606B : HIGH SPEED DIGITAL DESIGN

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)

Introduction to high-speed digital design - frequency, time and distance - capacitance and inductance effects - high speed properties of logic gates - speed and power - measurement techniques - rise time and bandwidth of oscilloscope probes - self inductance, signal pickup and loading effects of probes - observing crosstalk

Module II (14 hours)

Transmission line effects and crosstalk - transmission lines - point to point wiring - infinite uniform transmission lines - effects of source and load impedance - special transmission line cases - line impedance and propagation delay - ground planes and layer stacking - crosstalk in solid ground planes, slotted ground planes and cross-hatched ground planes - near and far end crosstalk

Module III (12 hours)

Terminations and vias - terminations - end, source and middle terminations - AC biasing for end terminations - resistor selection - crosstalk in terminators - properties of vias - mechanical properties of vias - capacitance of vias - inductance of vias - return current and its relation to vias

Module IV (12 hours)

Stable reference voltage and clock distribution - stable voltage reference - distribution of uniform voltage - choosing a bypass capacitor - clock distribution - clock skew and methods to reduce skew - controlling crosstalk on clock lines - delay adjustments - clock oscillators and clock jitter

Text books

1. Howard Johnson & Martin Graham, "*High Speed Digital Design: A Handbook of Black Magic*", Prentice Hall PTR
2. Dally W.S. & Poulton J.W., "*Digital Systems Engineering*", Cambridge University Press
3. Masakazu Shoji, "*High Speed Digital Circuits*", Addison Wesley Publishing Company

Sessional work assessment

Two tests	2 x 15 = 30
Two assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 606C : DATA STRUCTURES & ALGORITHMS

(common with AI2K/CE2K/EE2K/IC2K 606C)

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Review of data types - scalar types - primitive types - enumerated types - subranges structures types - character strings - arrays - records - sets - tiles - data abstraction - complexity of algorithms - time and space complexity of algorithms using "big oh" notation - recursion - recursive algorithms - analysis of recursive algorithms

Module II (12 hours)

Linear data structures - stacks - queues - lists - stack and queue implementation using array - linked list - linked list implementation using pointers

Module III (12 hours)

Non linear structures - graphs - trees - sets - graph and tree implementation using array linked list - set implementation using bit string, linked list

Module IV (16 hours)

Searching - sequential search - searching arrays and linked lists - binary search - searching arrays and binary search trees - hashing - introduction to simple hash functions - resolution of collisions - sorting: n^2 sorts - bubble sort - insertion sort - selection sort - NlogN sorts - quick sort - heap sort - merge sort - external sort - merge files

Text book

Aho A.V., Hopcroft J.E. & Ullman J.D., *Data Structures and Algorithms*, Addison Wesley

Reference books

1. Sahni S., *Data Structures, Algorithms, & Applications in C++,* McGraw Hill
2. Wirth N., *Algorithms +Data Structures = Programs*, Prentice Hall
3. Cormen T.H., Leiserson C.E., & Rivest R.L., *Introduction to Algorithms*, MIT Press

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module

Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one

Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one

Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one

Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one

EC2K 606D : ANALOG MOS CIRCUITS

(common with IC2K/AI2K 606D)

3 hours lecture and 1 hour tutorial per week

Module I (11 hours)

Analog MOS models - low frequency model - MOS in saturation - high frequency model - variation of transconductance with frequency - temperature effects in MOST - noise in MOST (shot, flicker and thermal noise) - MOS resistors and resistor circuits - super MOST

Module II (14 hours)

Current sources and sinks - current mirror - cascode current source - transient response of simple current mirror - Wilson current mirror - regulated cascode current source/sink - voltage references - resistor MOSFET and MOSFET only voltage references - band gap references - various biasing schemes for voltage references

Module III (12 hours)

Common source - common gate and source follower amplifiers - class AB amplifier - active load configuration - transimpedance amplifier - cascode amplifier - push pull amplifier - amplifier based signal processing - the differential difference amplifier (DDA) - adder, multiplier, divider and filters using DDA

Module IV (15 hours)

Mixed signal circuits - CMOS comparator design - pre amplification - decision and post amplification stages - transient response - clocked comparators - analog multiplier - the multiplying quad - level shifting in multipliers - dynamic analog circuits - charge injection and capacitive feed through in MOS switch - sample and hold circuits - switched capacitor filters - switched capacitor implementation of ladder filters

Reference books

1. Jacob Baker R., Li H.W.& Boyce D.E., `*CMOS - Circuit Design, Layout & Simulation*', PHI
2. Mohammed Ismail & Terri Fiez, *Analog VLSI - Signal & Information Processing*, MGH
3. Roubik Gregorian & Gabor C Temes, *Analog MOS Integrated Circuits for Signal Processing*, John Wiley

Sessional work assessment

Two tests	2 x 15 = 30
Two assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 606E : LINEAR SYSTEMS ANALYSIS

(common with AI2K/CE2K/CH2K/CS2K/IC2K/IT2K 606E)

3 hours lecture and 1 hour tutorial per week

Module I: System concepts and modelling of systems (11 hours)

Systems - subsystems - elements - systems approach - classification of systems - static and dynamic systems - linear and nonlinear systems - distributed and lumped systems - time invariant and time varying systems - stochastic and deterministic systems - system modeling and approximations - superposition principle - homogeneity and additivity - modelling of electrical systems - active and passive elements - resistance inductance and capacitance - dynamic equations using Kirchhoff's current and voltage laws. RL, RC and RLC circuits and their dynamic equations - block diagrams and signal flow graphs - masons gain formula

Module II: Modelling of non-electrical systems (11 hours)

Modelling of translational and rotational mechanical systems - differential equations for mass spring dashpot elements - D'Alembert's principle - rotational inertia - stiffness and bearing friction - gear trains - equivalent inertia and friction referred to primary and secondary shafts - dynamic equations for typical mechanical systems - electromechanical analogues - force-current and force-voltage analogue - capacitance and resistance of thermal, hydraulic pneumatic systems - dynamic equations for simple systems - comparison of electrical, electromechanical, hydraulic and pneumatic systems

Module III: Transfer function and time domain analysis (15 hours)

Use of Laplace transforms - concept of transfer function - impulse response - convolution integral - response to arbitrary inputs - transfer function of typical systems discussed in Module I - time domain analysis - test inputs - step - velocity and ramp inputs - transient and steady state response - first and second order - under damped and over damped responses - maximum overshoot - settling time - rise time and time constant - higher order systems - steady state error - error constants and error different types of inputs - Fourier series expansion of periodic functions - symmetry conditions - exponential form of Fourier series - Fourier integrals and Fourier transform - spectral properties of signals - analysis by Fourier methods

Module IV: State space analysis and stability of systems (15 hours)

Concept of state - state space and state variables - advantage over transfer function approach - state equations for typical electrical and mechanical and electromechanical systems - representation for linear time varying and time invariant systems - solution of state equation for typical test inputs - zero state and zero input response - concept of stability - bounded input bounded output stability - Lyapunov's definition of stability - a symptitic stability - stability in the sense of Lyapunov-Routh Hurwitz criterion of stability for single input single output linear systems described by transfer function model

Reference books

1. Cheng D.K. *Linear Systems Analysis*, Addison Wesley

2. Tripati J.N., *Linear Systems Analysis*, New Age International

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one

EC2K 606F : INTRODUCTION TO SOCIAL SCIENCES

(common with AI2K/IC2K/ME2K/PE2K/PM2K 606F)

3 hours lecture and 1 hour tutorial per week

Module I (8 hours)

Introduction - The history of social sciences - The beginnings - "The Two Cultures". Renaissance - Development of the various Social Sciences - History, Sociology, Economics, Psychology, Philosophy, Political Science, Geography - The method of social sciences - early figures - Plato, Aristotle, Auguste Comte

Module II (14 hours)

Philosophy and history - Philosophy as the mother of all sciences - history of Philosophy - issues in ancient, medieval and modern philosophy - Aristotle and Plato - renaissance thinkers - the Political System & socio-cultural environment of Renaissance - different thinkers - Plato, Scopenhauer, Kant, Sartre

History - historiography, classical history - readings from classics of historical writing - current debates in history (India World) - Modern Indian history

Module III (15 hours)

Sociology and psychology - the evolution of 'Sociology' - society - terms in Sociology - *Society, individual, caste, race, religion, class, tribe*

Social thinkers - Auguste Comte, Emile Durkiem , Karl Marx, Max Weber, Mahatma Gandhi

Sociologists - M.N. Srinivas, Y. Singh

Social evils and concerns - Dowry system, Indian caste system, Communalism, Globalisation

Psychology - the ancient views on human mind - the mind vs matter debate - terms in Psychology - different branches of Psychology - behavioral sciences - motivation - theory and practice - personality development - stress management - counseling - cognitive science - an introduction

Module IV (15 hours)

Polity and international affairs - concept of *State, Government and Polity* - various forms of government - relation of technology to politics

Indian polity - constitution - systems of governance - post independence policies - political and economic - rights and duties of citizens - secularism and national integration

International affairs - global politics, geography and geo-politics - Power zones - alliances and treaties UNO - international law - India's role in the next millenium

Text books

1. Will Durrant, *The Story of Philosophy*, Washington Square
2. Romila Thapar, *The History of Ancient India*, Vol. I & II
3. Nehru, *Glimpses of World History*, OUP
4. Bibin Chandra, *India's Struggle for Independence*
5. Basu D. D., *Introduction to the Constitution of India*, PHI
6. Basham A. L., *The Wonder That Was India*
7. Srinivas M.N., *Caste in Modern India*
8. Singh Y., *Modernisation of Indian Tradition*

Reading List

1. Baron, *Psychology*, Prentice Hall of India
2. Baron & Byrine, *Social Psychology*, Prentice Hall of India
3. Dikshit, *Geographical Thought - A Contextual History of Ideas*, Prentice Hall of India
4. Lipson, *The Great Issues of Politics - An Introduction to Political Science*
5. Mukharjee & Ramaswamy, *A History of Political Thought - Plato to Marx*
6. Dahl, *Modern Political Analysis*
7. *Linguistics - An Introduction to Language and Communication*
8. Inkeles, *What is Sociology? - An Introduction to the Discipline and Profession*
9. Nanda Baudev, *Indian Political Tradition*
10. Nanda Baudev, *Political Theory*
11. Vadrevu Sivaji, *Essentials of Indian Government and Politics*

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 607(P) : ANALOG COMMUNICATION LAB

3 hours practicals per week

1. AM generation
2. AM detection with simple and delayed AGC
3. Balanced modulator for DSB-SC signal
4. Mixer using JFET/BJT
5. FM generation (reactance modulator)
6. FM demodulation
7. PAM generation and demodulation
8. Generation and demodulation of PWM and PPM
9. Implementation of intermediate frequency amplifier
10. PLL characteristics and demodulation using PLL
11. AM generation and demodulation using opamps and IC multipliers
12. SSB generation and demodulation using integrated circuits

Sessional work assessment	
Laboratory practicals and record	= 30
Test/s	= 20
Total marks	= 50

EC2K 608(P) : MINI PROJECT

3 hours per week

Each group consisting of four members is expected to design and develop a moderately complex hardware system - a working model of the hardware system should be fabricated and tested - the assessment of all the mini-projects will be done by a committee consisting of three faculty members, specialized in various fields of electronics and communication engineering - the students will present and demonstrate the project work

before the committee - a detailed report is also to be submitted - sixty percent of total marks will be awarded by the guide and the remaining forty percent will be awarded by the evaluation committee

Sessional work assessment	
Design and Development	= 20
Demonstration	= 20
Report	= 10
Total marks	= 50

EC2K 701 : INDUSTRIAL MANAGEMENT

(common with AI2K/CS2K/EE2K/IC2K/IT2K 701)

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Principles of management - management functions - planning - organising - organisation structures - span of control - delegation - directing - leadership and motivation - controlling - decision making - single stage decision making under risk - multistage decision making - decision tree - decision making under uncertainty - equally likely, minimax and maximin criteria

Module II (14 hours)

Operation management - production systems and functions - product design and selection - concept of total quality management and ISO 9000 system of standards - concept of supply chain management - project management - projects and management - network analysis - critical path method (CPM) network - finding critical path - slacks - crashing (time-cost trade off) - PERT network

Module III (12 hours)

Marketing management - concept of market and marketing - marketing function - marketing mix - market research - advertising and sales promotion - human resources management - manpower requirement analysis - recruitment and training - job analysis - job evaluation - wages and incentives

Module IV (13 hours)

Financial management - objectives/functions - concept of time value of money - basics of financial accounting - profit and loss account - balance sheet - costing - elements of costs - cost sheet - allocation of overheads - break-even analysis depreciation - significance and methods of depreciation

Text books

1. Mazda F., *Engineering Management*, Addison Wesley
2. Buffa E.S. & Sarin R.K., *Modern Production/Operations Management*, John Wiley

3. Chase R.B., Aquilano N.J. & Jacobs F.R., *Production and Operations Management Manufacturing and Services*, Tata McGraw Hill Publishing Company Limited
4. Kolter P., *Marketing Management: Analysis, Planning, Implementation and Control*, Prentice Hall of India Private Limited
5. Venkata Ratnam C.S. & Srivastava B.K., *Personnel Management and Human Resources*, Tata McGraw Hill Publishing Company Limited
6. Pandey I.M., *Financial Management,* Vikas Publishing House Pvt. Ltd.
7. Bhattacharya A.K., *Principles and Practice of Cost Accounting*, Wheeler Publishing

Reference books

1. Koontz H., O'Donnel C. & Weihrich H., *Essentials of Management*, McGraw Hill
2. Satya Raju R. & Parthasarathy A., *Management: Text and Cases*, Prentice Hall
3. Wiest J.D. & Levy F.K., *A Management Guide to PERT/CPM,* Prentice Hall
4. Ramaswamy V.S. & Namakumari S., *Marketing Management: Planning, Implementation and Control*, Macmillan
5. Srinivasan R., *Case Studies in Marketing: The Indian Context*, Prentice Hall of India Private Limited
6. Majumadar R., *Marketing Research: Text, Applications and Case Studies,* New Age International (P) Limited Publishers
7. Prasanna Chandra, *Financial Management: Theory and Practice*, Tata McGraw Hill Publishing Company Limited

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15marks each from module IV with choice to answer any one

EC2K 702 : MICROWAVE DEVICES & COMMUNICATION

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Theory of waveguide transmission - rectangular waveguides - TE modes - TM modes - waveguide components - rectangular cavity resonator - circular cavity resonator (only basic ideas) - E-plane tee - magic tee - isolator - circulator - directional coupler - S matrix

Module II (12 hours)

Microwave linear beam tubes - klystron (bunching, output power and loading) - reflex klystron - traveling wave tube (amplification process, convection current, axial electric field, gain) - microwave crossed field tubes - magnetron (operation, characteristics and applications)

Module III (14 hours)

Semiconductor microwaves devices - microwave transistors - tunnel diodes and FETs - transferred electron devices - Gunn effect diodes - (Gunn effect, operation, modes of operation, microwave generation and amplification) - LSA diodes - InP diodes - Cd Te diodes - avalanche transit time devices - read diodes - impact diodes - trapatt diodes - baritt diodes

Module IV (14 hours)

Terrestrial microwave communication - basic principles of microwave links - link analysis - microwave relay systems - choice of frequency - line of sight and over the horizon systems - modulation methods - block schematic of terminal transmitters and receivers - effect of polarization - diversity receivers - digital microwave links - digital modulation schemes - fading - digital link design - satellite communication - orbit of communication satellites - angle of elevation - propagation delay - orbital spacing - satellite construction - transponders - antennas - multiple spot beams - earth station - link analysis - multiple access schemes - digital satellite links

Text books

1. Liao S.Y., "*Microwave devices and Circuits*", Prentice Hall of India
2. Gagliardi R.M., *Satellite Communication*, CBS Publishers

Reference books

1. Rizzi P.A., "*Microwave Engineering*, Passive Circuits Hall of India
2. Pozar D.M., "*Microwave Engineering*", John Wiley
3. Kamilo Feher, *Digital Communications*, Microwaves applications, PHI
4. Chatterji R., *Microwave Engineering*, Special topics, East West Press

Sessional work assessment

2 Tests	2 x 15 = 30
2 Assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 703 : INFORMATION THEORY & CODING

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)

Information theory - information and entropy - properties of entropy of a binary memoryless source - extension of a binary memoryless source - source coding theorem - Shannon fano coding - Huffman coding - Lempel ziv coding - discrete memoryless source - binary symmetric channel - mutual information - properties - channel capacity - channel coding theorem

Module II (14 hours)

Coding - linear block codes - generator matrices - parity check matrices - encoder - syndrome and error correction - minimum distance - error correction and error detection capabilities - cyclic codes - coding and decoding

Module III (14 hours)

Introduction to algebra - groups - fields - binary field arithmetic - construction of Galois field - basic properties - computations - vector spaces - mastrices - BCH codes - description - decoding - reed solomon codes

Module 1V (10 hours)

Coding - convolutional codes - encoder - generator matrix - transform domain representation - state diagram - distance properties - maximum likelihood decoding - viterbi decoding - sequential decoding - interleaved convolutional codes

Text books

1. Simon Haykins, *Communication Systems*, John Wiley
2. Shu Lin, Costello D.J., *Error Control Coding - Fundamentals and Applications*, Prentice Hall Inc. Englewood Cliffs

Reference books

1. Das J., Malik A.K., Chatterjee P.K., *Principles of Digital Communications*, New Age International
2. Simon Haykin, *Digital Communications*, John Wiley
3. Taub & Schilling, *Principles of Communication System*, Tata McGraw Hill
4. Tomasi, *Electronic Communication, Fundamentals Through Advanced*, Pearson education
5. Sklon, *Digital Communication*, Pearson Education
6. Couch, *Digital and Analog Communication System,* Pearson Education

Sessional work assessment

Two tests	2 x 15 = 30
Two assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one

Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 704 : COMPUTER COMMUNICATION & NETWORKING

3 hours lecture and 1 hour tutorial per week

Module I (15 hours)

Characteristics of communication networks - traffic characterization and quality of service CBR, VBR, UBR traffic - network services - flow control - congestion control - error control - error detection - ARQ retransmission strategies - analysis - OSI model - Ethernet - token ring - FDDI - DQDB - frame relay - IPV4, IPV6

Module II (12 hours)

TCP/UDP - TCP congestion control - congestion avoidance - window adjustment in TCP - routing optimization in datagram networks - circuit switched networks - SONET - SDH- routing optimization in circuit switched networks

Module III (15 hours)

Introduction to queueing theory - Markov chain - discrete time and continuous time Markov chains - poisson process - queueing models for datagram networks - Little's theorem - M/M/1 queueing system - M/M/m/m queueing models - infinite server case - M/G/1 queue - mean value analysis

Module IV (10 hours)

ATM networks - main features - statistical multiplexing - addressing, signaling and routing - ATM header structure - ATM adaptation layer - IP over ATM

Text books

1. Jean Walrand & Pravin Varaiya, "*High Performance Communication Networks*". Morgan Kaufman Publishers
2. Bertsekas D. & Gallager R., "*Data Networks*", Prentice Hall of India
3. Peterson L.L. & Davie B.S., "*Computer Networks: A System Approach*", Morgan Kaufman Publishers
4. Tannenbaum A., "*Computer Networks*", Prentice Hall

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one

Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 705A : BIOMEDICAL INSTRUMENTATION

(common with EE2K 705A)

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Electrical activity of excitable cells - SD curve - functional organization of the peripheral nervous system - electrocardiogram (in detail with all lead systems) - electroencephalogram - electromyogram - electroneurogram - electrode - electrolyte interface - polarisation - polarisable and non polarisable electrodes - surface electrodes - needle electrodes - micro electrodes - practical hints for using electrodes - 'skin -electrode' equivalent circuit - characteristics of 'bio - amplifiers'

Module II (13 hours)

Blood pressure - direct measurements - harmonic analysis of blood pressure waveform - systems for measuring venous pressure - heart sounds - phonocardiography - cardiac catheterisation - indirect blood pressure measurement - electromagnetic blood flow meters - ultrasonic blood flow meters - impedance plethysmography - photo plethysmography - 'indicator-dilution' method for blood flow determination - spirometry - measurement of various respiratory parameters - respiratory plethysmography - chamber plethysmography

Module III (13 hours)

Measurement of gas flow rate - cardiac pacemakers and other electric stimulators - defbrillators and cardio converters - blood pumps - hemodialysis - ventilators - infant incubators - drug delivery devices - lithotripsy - therapeutic applications of laser

Module IV (13 hours)

Physiological effects of electricity - important susceptibility parameters - macro shock hazards - micro shock hazards - protection against shock - electrical isolation - electrical safety analyzers - measurement of pH,pCO_2 and PO_2

Text books

1. Webster J., *Medical Instrumentation - Application and Design,* John Wiley
2. *Hand Book of Biomedical Instrumentation*, TMH

Reference books

1. Geddes & Baker, *Principles of Applied Biomedical Instrumentation*, Wiley
2. *Encyclopedia of Medical Devices and Instrumentation* Wiley
3. Bronzino, *Hand book of Biomedical Engineering,* IEEE Press book

Sessional work assessment

Test	2 x 15 = 30
Assignment	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 705B : INDUSTRIAL PSYCHOLOGY

(common for all programmes)

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Introduction - psychology as a science - areas of applications - study of individual - individual differences - study of behavior - stimulus - response behavior - heredity and environment - human mind - cognition - character - thinking - attention - memory- emotion - traits - attitude - personality

Module II (13 hours)

Organizational behavior - definition - development - fundamental concept - nature of people - nature of organization - an organizational behavior system - models - autocratic model - hybrid model - understanding a social - system social culture - managing communication - downward, upward and other forms of communication

Module III (13 hours)

Motivation - motivation driver - human needs - behavior modification - goal setting - expectancy model - comparison models - interpreting motivational models - leadership - path goal model - style - contingency approach

Module IV (13 hours)

Special topics in industrial psychology - managing group in organization - group and inter group dynamics -managing change and organizational development - nature planned change - resistance - characteristic of OD - OD process

Reference books

1. Davis K. & Newstrom J.W., "*Human Behavior At Work*", McGraw Hill International
2. Schermerhorn J.R. Jr., Hunt J.G. & Osborn R.N., "*Managing Organizational Behavior*", John Willy
3. Luthans, "*Organizational Behavior*", McGraw Hill, International
4. Morgan C.T., King R.A., John Rweisz & John Schoples, "*Introduction to Psychology*", McGraw Hill
5. Blum M.L. & Naylor J.C., Horper & Row, "*Industrial Psychology*", CBS Publisher

Sessional work assessment

2 Tests	2 x 15 = 30
2 Assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15marks each from module IV with choice to answer any one

EC2K 705C : ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

(common with AI2K/EE2K/IC2K/ME2K/PE2K/PM2K 705C)

3 hours lecture and 1 hour tutorial per week

Module I (16 hours)

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

Module II (14 hours)

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 (12 hours)

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

Module IV (10 hours)

Introduction to understanding natural language - introduction to automated reasoning - introduction to machine learning

Text book

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

Reference books

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

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 705D : DIGITAL SIGNAL PROCESSORS

(common with AI2K/IC2K 705D)

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

High level overview of digital signal processing - DSP system features and applications - introduction to DSP processors - common features of DSP processors - numeric representations and arithmetic - fixed point versus floating point - extended precision - floating point and block floating point - data path - fixed and floating point data paths

Module II (12 hours)

Memory architecture - harvard architectures - multiple access memories - program caches - wait states - ROM - external memory interfaces - multiprocessor support - dynamic memory - DMA - different addressing modes used in DSP processors

Module III (12hours)

Instruction set - instructions commonly found in DSP processors - various instruction types - special function instructions - review of registers in DSPs - orthogonality of the instruction set - assembly language format - execution control - hardware looping - interrupts stacks - relative branch support - pipelining - pipeline programming models

Module IV (16 hours)

Peripherals - serial ports - timers - parallel ports - host ports - communication ports - on chip A/D and D/A converters - external Interrupts - on chip debugging facilities - DSP development tools - assembly language tools - high level languages development tools - block diagram based programming tools - DSP system design flow - choosing a processor architecture - DSP processor trends - an example DSP architecture analog devices/Motorola/Texas instruments - alternatives to commercial DSP processors

Text books

Lapsley P., Jeff Bier, Amit Shoham & Lee E.A., "*DSP Processor Fundamentals-Architectures and Features*", IEEE Press

Reference books

1. Ifeachor E.C., Jervis B.W., "*Digital Signal Processing: A Practical Approach"*, Addison Wesley

2. Smith S.W., "*The Scientist and Engineer's Guide to Digital Signal Processing"*, www.DSPguide.com
3. Padmanabhan K., Ananthi S. & Vijayarajeswaran R., "*A Practical Approach to Digital Signal Processing*", New Age International Publishers
4. Bateman, Andrew Yates & Warren, "*Digital Signal Processing Design*", Pitman

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 705E : TELEVISION ENGINEERING & RADAR SYSTEMS

(common with AI2K/IC2K 705E)

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)

Principles of television - image continuity - interlaced scanning - blanking - synchronizing - video and sound signal modulation - channel bandwidth - vestigial sideband transmission - VSB correction - positive and negative modulation - transmitter and receiver block diagrams - CCD camera

Module II (14 hours)

Colour TV - Colour perception - luminance, hue and saturation - colour TV camera and picture tube - colour signal transmission - bandwidth - modulation - formation of chrominance signal - principles of NTSC, PAL and SECAM coder and decoder

Module III (14 hours)

Digital TV - composite digital standards - 4 f_{sc} NTSC standard - general specifications - sampling structure - general concept of video bit reduction - MPEG standard - digital transmission - cable TV - cable frequencies - co-axial cable for CATV - cable distribution system - cable decoders - wave traps and scrambling methods

Module IV (10 hours)

Radar systems - radar frequencies - radar equation - radar transmitter and receiver (block diagram approach) - continuous wave radar - frequency modulated CW radar - moving target indicator radar - tracking radar

Text books

1. Gulati R.R., *Modern Television Engineering*, Wiley Eastern Ltd.
2. Michael Robin & Michael Poulin, *Digital Television Fundamentals*, McGraw Hill
3. Bernard Grob & Charles E. Herndon, *Basic Television and Video Systems*, McGraw Hill International

4. *Introduction to Radar Systems,* McGraw Hill, Kogakusha Ltd.

Reference books

1. Dhake A.M., *Television Engineering*, Tata McGraw Hill
2. Damacher P., *Digital Broadcasting,* IEE Telecommunications Series

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 705F : ENTREPRENEURSHIP

(common for all programmes)

3 hours lecture and 1 hour tutorial per week

Module I (20 hours)

Entrepreneurial perspectives - understanding of entrepreneurship process - entrepreneurial decision process - entrepreneurship and economic development - characteristics of entrepreneur - entrepreneurial competencies - managerial functions for enterprise

Module II (10 hours)

Process of business opportunity identification and evaluation - industrial policy - environment - market survey and market assessment - project report preparation - study of feasibility and viability of a project - assessment of risk in the industry

Module III (12 hours)

Process and strategies for starting a venture - stages of small business growth - entrepreneurship in international environment - entrepreneurship - achievement motivation - time management creativity and innovation structure of the enterprise - planning, implementation and growth

Module IV (10 hours)

Technology acquisition for small units - formalities to be completed for setting up a small scale unit - forms of organizations for small scale units - financing of project and working capital - venture capital and other equity assistance available - break even analysis and economic ratios technology transfer and business incubation

Reference books

1. Harold Koontz & Heinz Weihrich, *Essentials of Management*, McGraw Hill International
2. Hirich R.D. & Peters Irwin M.P., *Entrepreneurship*, McGraw Hill
3. Rao T.V. & Deshpande M.V., Prayag Metha & Nadakarni M.S., *Developing Entrepreneurship A Hand Book,* Learning Systems
4. Donald Kurado & Hodgelts R.M.*, Entrepreneurship A Contemporary Approach,* The Dryden Press
5. Dr Patel V.G., *Seven Business Crisis*, Tata McGraw Hill
6. Timmons J.A., *New Venture Creation - Entrepreneurship for 21st Century,* McGraw Hill International
7. Patel J.B., Noid S.S., *A Manual on Business Opportunity Identification*, *Selections*, EDII
8. Rao C.R., *Finance for Small Scale Industries*
9. Pandey G.W., *A Complete Guide to Successful Entrepreneurship,* Vikas Publishing

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 705G : WAVELETS

3 hours lecture and 1 hour tutorial per week

Module I (10 hours)

Fundamentals of signal decomposition - brief overview of Fourier transform and short term Fourier transform - introduction to wavelets - continuous wavelet transform - definition - CWT as a correlation - time frequency resolution

Module II (12 hours)

Introduction to the DWT and orthogonal wavelet decomposition - approximation of vectors in nested linear vector spaces - example of an MRA - orthogonal wavelet decomposition based on the Haar wavelet - digital filter implementation of the Haar wavelet decomposition (Mallat's algorithm)

Module III (15 hours)

Construction of a general orthonormal MRA - formal definition - implication of the dilation equation and orthogonality - two scale relation for the wavelet function - digital filter implementation - reconstruction of the signal - introductory concepts of biorthogonal wavelet basis and wavelet packets - two-dimensional wavelet decomposition - regularity - vanishing moments

Module IV (15 hours)

Applications - image compression - EZW algorithm - audio compression - signal denoising - edge detection - object isolation - image fusion - medical applications

Text book

Rao R.M. & Bopardikar A.S., '*Wavelet Transforms-Introduction to Theory and Applications*'

Reference books

1. Sidney Burrus, Gopinath R.A. & Haitao Guo, *Introduction to Wavelets and Wavelet Transforms*", Prentice Hall International.
2. Chan Y.T., '*Wavelet Basics*', Kluwer Academic Publishers
3. Goswami J.C. & Chan A.K., '*Fundamentals of Wavelets - Theory Algorithms and Applications*'

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 706(P) : DIGITAL COMMUNICATION LAB

(3 hours practicals per week)

1. Sampling and reconstruction of low pass signals
2. PCM generation
3. Differential PCM generation
4. Implementation of Delta modulator and demodulator
5. Implementation of line coding schemes: bipolar, Manchester and differential codes
6. Equalization and Digital Regeneration
7. Matched filter receiver for rectangular pulse

8. Generation and detection of BASK and BFSK signals

9. Generation and detection of BPSK signals

10. Generation and detection of QAM using IC multipliers

11. Implementation of Analog to Digital Converters

12. Implementation of Digital to Analog Converts

Sessional work assessment	
Laboratory practicals and record	= 30
Test/s	= 20
Total marks	= 50

EC2K 707(P) : SEMINAR

3hours per week

Each student is expected to give a seminar on a topic of current relevance in electronics and communication engineering - they have to refer published papers from standard journals - the seminar report must not be the reproduction of the original paper

Sessional work assessment	
Presentation	= 30
Report	= 10
Discussion	= 10
Total marks	= 50

EC2K 708(P) : PROJECT

4 hours per week

This project work is for a duration of two semesters - each student group consisting of not more than five members is expected to develop a complete product - the design and development of which may include hardware and /or software - the assessment of all projects will be done semester by a committee consisting of four faculty members of the department - an interim report is to be submitted at the end of 7th semester - student will present their project work before the committee

Sessional work assessment	
Progress	= 35
Presentation	= 10
Report	= 5
Total marks	= 50

EC2K 801 : ECONOMICS

(common with AI2K/CS2K/EE2K/IC2K/IT2K 801)

3 hours lecture & 1 hour tutorial per week

Module I (13 hours)

Definition of economics - nature and scope of economic science - nature and scope of managerial economics - basic terms and concepts - goods - utility - value - wealth - factors of production - land - its peculiarities - labour - its peculiarities and division of labour - capital and capital formation - organisation or enterprise - economies of large and small scale - consumption - wants - its characteristics and classification - law of diminishing marginal utility - relation between economic decision and technical decision - economic efficiency and technical efficiency

Module II (13 hours)

Demand - demand schedule - demand curve - law of demand - elasticity of demand - types of elasticity - factors determining elasticity - measurement - its significance - supply - supply schedule - supply curve - law of supply - elasticity of supply - time element in the determination of value - market price and normal price - perfect competition - monopoly - monopolistic competition

Module III (13 hours)

Forms of business - proprietorship - partnership - joint stock company - cooperative organisation - state enterprise - mixed economy - money and banking - nature and functions of money - theory of money - inflation and deflation - banking - kinds - commercial banks - central banking functions - control of credit - monetary policy - credit instrument

Module IV (13 hours)

International trade - distinction between internal and international trade - theory of international trade - free trade v/s protection - balance of trade and balance of payments - exchange control - trade policy of the Government of India - national income - concepts - measurement - difficulties in the measurement its significant - features of underdeveloped economy with special reference to India - taxation - canons of taxation - direct and indirect tax - impact and incidence of the tax - working capital - factors affecting - sources

Reference books

1. Dewett K.K. & Varma J.D., *Elementary Economic Theory,* S Chand
2. Barthwal R.R., *Industrial Economics - An Introductory Text Book*, New Age
3. Jhingan M.L., *Micro Economic Theory*, Konark
4. Samuelson P.A., *Economics - An Introductory Analysis*, McGraw Hill
5. Adhikary M., *Managerial Economics*

Sessional work assessment	
2 Tests	2 x 15 = 30
2 Assignments	2 x 10 = 20

Total marks = 50

University examination pattern

Q1 - 8 short type questions of 5 marks each, 2 from each module
QII - 2 questions A and B of 15 marks each from module I with choice to answer any one
QIII- 2 questions A and B of 15 marks each from module II with choice to answer any one
QIV- 2 questions A and B of 15 marks each from module III with choice to answer any one
QV - 2 questions A and B of 15 marks each from module IV with choice to answer any one

EC2K 802 : OPTICAL COMMUNICATION

3 hours lecture and 1 hour tutorial per week

Module I (15 hours)

Solution to Maxwell's equation in a circularly symmetric step index optical fiber - linearly polarized modes - single mode and multimode fibers - concept of V number - graded index fibers - total number of guided modes (no derivation) - polarization maintaining fibers - attenuation mechanisms in fibers - dispersion in single mode and multimode fibers - dispersion shifted and dispersion flattened fibers - attenuation and dispersion limits in fibers - nonlinear self phase modulation effect in single mode fibers

Module II (11 hours)

Optical sources - LED and laser diode - principles of operation - concepts of line width - phase noise - switching and modulation characteristics - typical LED and LD structures - optical detectors - pn detector - pin detector - avalanche photodiode - principles of operation - concepts of responsivity - sensitivity and quantum efficiency - noise in detection - typical receiver configurations (high impedance and transimpedance receivers)

Module III (14 hours)

Intensity modulated direct detection systems - quantum limit to receiver sensitivity - detected signal & shot noise - ISI and equalization - coherent systems - homodyne and heterodyne systems - system structures - coherent systems using PSK, FSK, ASK and DPSK modulations - related noise effects - performance degradation induced by laser phase and intensity noise - degradation due to fiber dispersion - degradation induced by nonlinear effects in fiber propagation

Module IV (12 hours)

Optical amplifiers - semiconductor amplifier - rare earth doped fiber amplifier (with special reference to erbium doped fibers) - Raman amplifier - Brillouin amplifier - principles of operation - amplifier noise - signal to noise ratio - gain - gain bandwidth - gain and noise dependencies - intermodulation effects - saturation induced crosstalk - wavelength range of operation

Reference books

1. Kazovsky L., Benedetto S. & Willner A., *Optical Fiber Communication Systems*', Artech House
2. John Senior, *Optical Fiber Communications*, PHI
3. Betti S., Marchis G.D. & Eugenio Iannone, '*Coherent Optical Communications Systems'*, John Wiley
4. Agrawal G.P., '*Nonlinear Fiber Optics'*, II Ed., Academic Press

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 803 : MICROELECTRONICS TECHNOLOGY

3 hours lecture & 1 hour tutorial per week

Module I (15 hours)

Wafer processing - diffusion - Fick's law - analytic solutions for predeposition and drive-in diffusion - oxidation - deal-grove model - ion implantation - vertical and lateral projected ranges - channeling - stopping power - optical lithography - optical exposures - modulation transfer function - proximity and projection printing - photoresists - types - contrast curves - etching - wet, plasma and ion etching - epitaxial growth - MOCVD and molecular beam epitaxy

Module II (12 hours)

Device isolation - contacts and metallization - junction and oxide isolation - LOCOS - SILO - SWAMI process - trench isolation - silicon on insulator isolation - schottky contacts - implanted ohmic contacts - alloyed contacts - refractory metal contact technology - multi level metallization

Module III (12 hours)

CMOS and bipolar technologies - early bipolar process - advanced bipolar processes - CMOS process - p well process - twin tub process - hot carrier effects in BJT and CMOS - BiCMOS fabrication process sequence

Module IV (13 hours)

VLSI design fundamentals - layout and design rules for well, pads, metal layers, poly 1, poly 2 - layout using cell hierarchy - layout of MOSFET - layout of the inverter - NOR and NAND gates - layout of junction isolated BJT

Text books

1. Campbell S.A., *The Science & Engineering of Microelectronic Fabrication*, Oxford University Press
2. Nagchowdhiri D., *Principles of Microelectronics Technology*, Wheeler Publishing
3. Pucknell D.A. & Kamran Eshragian, '*Basic VLSI Design*', PHI

Reference books

1. Sze S.M., '*VLSI Technology*', MGH
2. Chang C.Y. & Sze S.M., '*VLSI Technology*', MGH
3. Ruska W.S., '*Microelectronic Processing*', MGH
4. Backmann K.J., '*The Material Science of Microelectronics*', VCH Publishers
5. Jacob Baker R., Li H.W. & Boyce D.E., '*CMOS - Circuit Design, Layout & Simulation'*, PHI

Sessional work assessment	
2 Tests	2 x 15 = 30

2 Assignments 2 x 10 = 20 Total marks = 50

University examination pattern Q I - 8 short type questions of 5 marks each, 2 from each module Q II - 2 questions of 15marks each from module I with choice to answer any one Q III - 2 questions of 15marks each from module II with choice to answer any one Q IV - 2 questions of 15marks each from module III with choice to answer any one Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 804 : COMMUNICATION SWITCHING SYSTEMS

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Electronic switching systems: basics of a switching system - electronic space division switching - stored program control - time division switching - time multiplexed space switching - time multiplexed time switching - two stage, three stage and N-stage combination switching

Module II (14 hours)

Digital circuit switching networks: two-stage network - three-stage network - n-stage network - non-blocking switches - blocking probability analysis of multistage switches - lee approximation - improved approximate analysis of blocking switch - examples of digital switching systems - AT & T 5ESS and NTI - DMS 100 switching systems

Module III (14 hours)

Elements of traffic engineering: network traffic load and parameters - grade of service and blocking probability - incoming traffic and service time characterization - blocking models and loss estimates - delay systems

Module IV (12 hours)

Signaling: customer line signaling - outband signaling - inband signaling - PCM signaling - inter register signaling - common channel signaling principles - CCITT signaling system No: 7 - digital customer line signaling

Introduction to ATM switching – Strict sense non block switch – self routing switches – Bense network – ATM routers – Design of typical switches.

Text books

1. Viswanathan T., *Telecommunication Switching Systems and Networks*, Prentice Hall of India Pvt. Ltd.
2. Schwartz M., *Telecommunication Networks - Protocols, Modeling and Analysis*, Addison Wesley Publishing Company

Reference books

1. Flood J.E., *Telecommunications Switching Traffic and Networks*, Pearson Education Pvt. Ltd.

2. Freeman R.L., *Telecommunication System Engineering*, Wiley Inter Science Publications
3. Das J., *Review of Digital Communication*, New Age Internal (P) Ltd., Publishers

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 805A : WIRELESS MOBILE COMMUNICATION

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Mobile radio propagation - free space propagation model - ground reflection model - large scale path loss - small scale fading and multipath propagation - impulse response model of a multipath channel - parameters of a mobile multipath channel - multipath delay spread - doppler spread - coherence band width - coherence time - time dispersion and frequency selective fading - frequency dispersion and time selective fading - concepts of level crossing rate and average fade duration

Module II (14 hours)

Digital communication through fading multipath channels - frequency non selective, slowly fading channels - frequency selective, slowly fading channels- calculation of error probabilities - tapped delay line model - the RAKE demodulator performance - diversity techniques for mobile wireless radio systems concept of diversity branch and signal paths - combining methods - selective diversity combining - pre-detection and post detection combining - switched combining - maximal ratio combining- equal gain combining

Module III (12 hours)

Cellular concept - frequency reuse - cochannel interference - adjacent channel interference - power control for reducing interference - improving capacity in cellular systems - cell splitting - sectoring - hand off strategies - channel assignment strategies - call blocking in cellular networks

Module IV (14 hours)

Fundamental concepts of spread spectrum systems - pseudo noise sequence - performance of direct sequence spread spectrum systems - analysis of direct sequence spread spectrum systems - the processing gain and anti jamming margin - frequency

hopped spread spectrum systems - time hopped spread spectrum systems - synchronization of spread spectrum systems

Text books

1. Kamilo Feher, '*Wireless Digital Communications'*, PHI
2. Rapport T.S., '*Wireless Communications*, *Principles and Practice*', Prentice Hall
3. Lee W.C.Y., '*Mobile Cellular Telecommunication'*, MGH
4. Proakis J.G., '*Digital Communications*', MGH

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 805B : INTERNET TECHNOLOGIES

(common with AI2K/CE2K/CH2K/EE2K/IC2K/ME2K/PE2K/PM2K 805B)

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Computer networks and the internet - principles of application-layer protocols - HTTP - FTP - e-mail - DNS - socket programming with TCP/UDP - web servers - web pages design using HTML and XML

Module II (13 hours)

Multimedia networking - applications - streaming stored audio and video - internet telephony - RTP - scheduling and policing mechanisms - integrated services - RSVP - differentiated services - *network management* - the internet network management framework

Module III (14 hours)

Network security - *E-mail security* - privacy - S/MIME - *IP security* - overview - architecture - authentication - header and payload - combining security associations - key management - *web security* - SSL and transport layer security - SET - *systems security* - intruders and viruses - *firewalls* - design - trusted systems

Module IV (13 hours)

Mobile internet - *mobile network layer* - mobile IP - dynamic host configuration protocol -ad hoc networks - *mobile transport layer* - implications of TCP on mobility - indirect TCP - snooping TCP - mobile TCP - transmission - selective retransmission - transaction-

oriented TCP - *support for mobility* - file systems - WAP protocols - WML - WML script - wireless telephony applications

Text books

1. Kurose J.F. & Ross K.W., *Computer Networking: A Top-Down Approach Featuring the Internet*, Addison Wesley, Modules I & II
2. Stallings W., *Cryptography and Network Security Principles and practice*, Pearson Education Asia, Module III
3. Schiller J., *Mobile Communications*, Addison Wesley, Module IV

Reference books

1. Deitel H.M., Deitel P.J. & Nieto T.R., *Internet And World Wide Web: How to Program*, Pearson Education
2. Greenlaw R & Hepp E, *In-line / On-line: Fundamentals Of The Internet And The World Wide Web*, Tata McGraw Hill
3. Sharma V. & Sharma R, *Developing e-Commerce Sites: An Integrated Approach*, Addison Wesley
4. Singhal et. al S., *The Wireless Application Protocol*, Pearson Education Asia
5. Goncalves M., *Firewalls: A Complete Guide*, Tata McGraw Hill

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 805C : NEURAL NETWORKS & FUZZY LOGIC

(common with AI2K/CS2K/EE2K/IC2K/IT2K/ME2K/PM2K 805C)

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Introduction to artificial neural networks - biological neurons - Mc Culloch and Pitts modals of neuron - types of activation function - network architectures - knowledge representation - learning process - error-correction learning - supervised learning - unsupervised learning - single unit mappings and the perceptron - perceptron convergence theorem (with out proof) - method of steepest descent - least mean square algorithms - adaline/medaline units - multilayer perceptrons - derivation of the back-propagation algorithm

Module II (13 hours)

Radial basis and recurrent neural networks - RBF network structure - covers theorem and the separability of patterns - RBF learning strategies - K-means and LMS algorithms - comparison of RBF and MLP networks - recurrent networks - Hopfield networks - energy function - spurious states - error performance - simulated annealing - the Boltzman machine - Boltzman learning rule - the mean field theory machine - MFT learning algorithm - applications of neural network - the XOR problem - traveling salesman problem - image compression using MLPs - character retrieval using Hopfield networks

Module III (13 hours)

Fuzzy logic - fuzzy sets - properties - operations on fuzzy sets - fuzzy relations - operations on fuzzy relations - the extension principle - fuzzy measures - membership functions - fuzzification and defuzzification methods - fuzzy controllers - Mamdani and Sugeno types - design parameters - choice of membership functions - fuzzification and defuzzification methods - applications

Module IV (13 hours)

Introduction to genetic algorithm and hybrid systems - genetic algorithms - natural evolution - properties - classification - GA features - coding - selection - reproduction - cross over and mutation operators basic GA and structure

Introduction to Hybrid systems - concept of neuro-fuzzy and neuro-genetic systems

Reference books

1. Simon Haykins, "*Neural Network a - Comprehensive Foundation"*, Macmillan College, Proc, Con, Inc
2. Zurada J.M., "*Introduction to Artificial Neural Systems,* Jaico Publishers
3. Driankov D., Hellendoorn H. & Reinfrank M., "*An Introduction to Fuzzy Control*", Narosa
4. Ross T.J., *"Fuzzy Logic with Engineering Applications"*, McGraw Hill
5. Bart Kosko. *"Neural Network and Fuzzy Systems"*, Prentice Hall, Inc., Englewood Cliffs
6. Goldberg D.E., *"Genetic Algorithms in Search Optimisation and Machine Learning"*, Addison Wesley
7. Suran Goonatilake & Sukhdev Khebbal (Eds.), *"Intelligent Hybrid Systems*", John Wiley

Sessional work assessment

Test	2 x 15 = 30
Assignment	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 805D : IMAGE PROCESSING

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Basic ideas in digital image processing - problems and applications - image representation and modeling - two dimensional systems - shift in variant linear systems - two dimensional Fourier transform and its properties - optical theory and modulation transfer functions - matrix theory - block matrices and Kronecker products - random fields - spectral density function

Module II (13 hours)

Image perception - light, luminance, brightness and contrast - MTF of the visual system - visibility function - monochrome vision models - image fidelity criteria - colour representation - colour matching and reproduction - colour co-ordinate systems - colour difference measures - colour vision models - temporal properties of vision - image sampling and quautization - image scanning - display and recording - two dimensional sampling - practical limitations - image quantization basic ideas

Module III (13 hours)

Unitary image transforms - basic ideas - two dimensional DFT - cosine transform - sine transforms - hardamard transform - harr transform - slant transform - KL transform - SVD transform - image enhancement - point operations - histogram equalization and modification - spatial operations - transforms operations - multispectral image enhancement - colour image enhancement

Module IV (13 hours)

Image restoration - image observation models - inverse filtering - wiener filtering Image compression - pixel coding - predictive coding - transform coding - basic ideas

Text books

1. Jain A.K., "*Fundamentals of Digital Image Processing"* PHI
2. Pratt W.K., "*Digital Image Processing"*, John Wiley

Reference books

1. Gonzalez R.C. & Woods R.C., "*Digital Image Processing*", Addison Wesley
2. Azriel Rosenfeld & Kak A.C., "*Digital Picture Processing*", Vol.1&2, Academic Press
3. Netravalli A.N. & Hasbell B.G., "*Digital Pictures-Representation Compression and Standards"*, Plenum Press
4. Dougherty E.R. (Ed), "*Digital Image Processing Methods*", Marcel Dekker Inc.

Sessional work assessment

2 Tests	2 x 15 = 30
2 Assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 805E : SATELLITE COMMUNICATION SYSTEMS

(common with AI2K/EE2K/IC2K 805E)

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Satellite orbits - solar day and sidereal day - orbital parameters - satellite trajectory - period, velocity and position of a satellite - geostationary satellites - non-geostationary constellations - launching of geostationary satellites - Hohmann transfer - effect of earth's shape - other heavenly bodies - atmospheric drag and radiation pressure on the satellite's orbit

Module II (13 hours)

Communication satellites - spacecraft subsystems - payload - repeater, antenna, attitude and control systems - telemetry, tracking and command - power sub system and thermal control

Earth stations - antenna and feed systems - satellite tracking system - amplifiers - fixed and mobile satellite service earth stations

Module III (13 hours)

Communication link design - frequency bands used - antenna parameters - transmission equations - noise considerations - link design - very small aperture terminals (VSAT) - VSAT design issues

Module IV (13 hours)

Multiple access techniques - frequency division multiple access - time division multiple access - code division multiple access - access protocols for data tarffic

Reference books

1. Richharia M., *Satellite Communication Systems*, Macmillan Press Ltd.
2. Gagliardi R.M., *Satellite Communication*, CBS
3. Ha T.T., *Digital Satellite Communication,* MGH

Sessional work assessment

2 Tests	2 x 15 = 30
2 Assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 805F : ELECTRONIC COMMERCE

(common with CS2K/IT2K 804, AI2K/EE2K/IC2K 805F)

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)

Web commerce concepts - electronic commerce environment - electronic marketplace technologies - web based tools for e-commerce - e-commerce softwares - hosting services and packages - modes of e-commerce - EDI - commerce with WWW/ internet

Module II (12 hours)

Security issues - threats to e-commerce - approaches to safe e-commerce - secure transactions and protocols - intruder approaches - security strategies and tools - encryption - security teams - protecting e-commerce assets - protecting client machines - servers and channels - transaction integrity

Module III (12 hours)

Electronic payment systems - types of e-payment - internet monetary payment and security requirements - payment and purchase order process - electronic cash - electronic wallets - smart cards - credit and charge cards - risks - design of e-payment systems

Module IV (14 hours)

Strategies for marketing - creating web presence - identifying and reaching customers - web branding - sales on the web - strategies for purchasing and support activities - EDI - supply chain management - softwares for purchasing - strategies for web auctions - virtual communities and web portals - international - legal - ethical and tax issues - planning and managing e-commerce projects

Text books

1. Kalakota R. & Whinston A.B., *"Frontiers of Electronic Commerce*", Addison Wesley
2. Schneider G.P. & Perry J.T., *Electronic Commerce, Course Technology*

Reference books

1. Westland J.C. & Clark T.H.K., "*Global Electronic Commerce"*, University Press
2. Minoli D. & Minoli E., "*Web Commerce Technology Handbook"*, Tata McGraw Hill
3. Stallings W., "*Cryptography and Network Security Principles And Practice"*, Pearson Education Asia
4. Treese G.W. & Stewart L.C., "*Designing Systems for Internet Commerce*", Addison Wesley

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30

Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 805G : SPEECH PROCESSING

3 hours lecture and 1 hour tutorial per week

Module I (15 hours)

Digital models for the speech signal - mechanism of speech production - acoustic theory - lossless tube models - digital models - linear predictive coding of speech - auto correlation - formulation of LPC equation - solution of LPC equations - levinson durbin algorithm - levinson recursion - schur algorithm - lattice formulations and solutions - PARCOR coefficients

Module II (15 hours)

Spectral analysis of speech - short time fourier analysis - filter bank design - speech coding - subband coding of speech - transform coding - channel vocoder - formant vocoder - cepstral vocoder - vector quantizer coder

Module III (12 hours)

Speech synthesis - pitch extraction algorithms - gold rabiner pitch trackers - autocorrelation pitch trackers - voice/unvoiced detection - homomorphic speech processing - homomorphic systems for convolution - complex cepstrums - pitch extraction using homomorphic speech processing

Module IV (10 hours)

Automatic speech recognition systems - isolated word recognition - connected word recognition - large vocabulary word recognition systems - pattern classification - DTW, HMM - speaker recognition systems - speaker verification systems - speaker identification systems

Text books

1. Rabiner L.R. & Schafer R.W., "*Digital Processing of Speech Signals*", Prentice Hall Inc.
2. Thomas Parsons, "*Voice and Speech Processing*", McGraw Hill Series
3. Saito S. & Nakata K., "*Fundamentals of Speech Signal Processing*", Academic Press, Inc.

Reference books

1. Owens F.J., "*Signal Processing of Speech*", Macmillan New Electronics
2. Papamichalis P.E., "*Practical Approaches to Speech Coding*", Texas Instruments, Prentice Hall

3. Rabiner L.R. & Gold, "*Theory and Applications of Digital Signal Processing*", Prentice Hall of India

Sessional work assessment

2 Tests	2 x 15 = 30
2 Assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EC2K 806(P) : ADVANCED COMMUNICATION ENGG. LAB.

3 hours practicals per week

Microwave and optical experiments

1. Klystron characteristics o/p power & frequency versus repeller voltage
2. Slotted line measurements. VSWR & Impedance
3. Antenna radiation pattern measurements
4. Directional coupler and isolator
5. Optical fibre experiments. Analog & digital

Experiments using matlab/ DSP kit

6. IIR filter-low pass & high pass
7. FIR filter-low pass &high pass
8. MMSE Equalizer implementations

Hardware experiments

9. PN and Orthogonal code generators
10. Digital TDM
11. Cyclic encoder and decoder
12. Spreader and de-spreader for CDMA

Sessional work assessment

Laboratory practicals and record	= 30
Test/s	= 20
Total marks	= 50

EC2K 807(P) : PROJECT

7 hours per week

This project work is the continuation of the 7th semester project - the student should complete the project work in this semester and present it before the assessing committee - the assessment committee as constituted in the 7th semester will assess the various projects, fix the relative gradings and group average marks - the guide will award the marks for the individual student in a project, maintaining the group average

Sessional work assessment	
Design & Development	= 40
Presentation & Demonstration	= 40
Report	= 20
Total marks	= 100

EC2K 808(P) : VIVA VOCE

There is only university examination for this - examiners will be appointed by the university for conducting the viva voce - the viva voce exam will be based on the subjects studied for the B.Tech course, mini project, project and seminar reports of the student - the relative weightages would be as follows

Sessional work assessment	
Subjects	: 30
Mini project	: 20
Project	: 30
Seminar	: 20
Total marks	: 100