KANNUR UNIVERSITY

FACULTY OF ENGINEERING

Curricula, Scheme of Examinations & Syllabus for Semesters V & VI of B.Tech. Degree Programme in Electronics & Communication Engineering with effect from 2007 Admissions

FIFTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
2K6 EC 501	Engineering Mathematics IV	3	1	-	**50**	3	**100**
2K6 EC 502	Economics and Business Management	3	1	-	**50**	3	**100**
2K6 EC 503	Applied Electromagnetic Field theory	3	1	-	**50**	3	**100**
2K6 EC 504	Computer Organization & Architecture	3	1	-	**50**	3	**100**
2K6 EC 505	Linear Integrated Circuits	3	1	-	**50**	3	**100**
2K6 EC 506	Microprocessors and Microcontrollers	3	1	-	**50**	3	**100**
2K6 EC 507(P)	Linear Integrated Circuits Lab	-	-	**3**	**50**	3	**100**
2K6 EC 508(P)	Computer Programming Lab	-	-	**3**	**50**	3	**100**
TOTAL		**18**	**6**	**6**	**400**	-	**800**

SIXTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
2K6 EC 601	Environmental Engineering & Disaster Management	3	1	-	**50**	3	**100**
2K6 EC 602	Control Systems	3	1	-	**50**	3	**100**
2K6 EC 603	Radiation& Propagation	3	1	-	**50**	3	**100**
2K6 EC 604	Digital Signal Processing	3	1	-	**50**	3	**100**
2K6 EC 605	Digital Communication	3	1	-	**50**	3	**100**
2K6 EC 606	Elective-I	3	1	-	**50**	3	**100**
2K6 EC 607(P)	Communication Engineering Lab -I	-	-	**3**	**50**	3	**100**
2K6 EC 608(P)	Microprocessors & Microcontroller lab	-	-	**3**	**50**	3	**100**
TOTAL		**18**	**6**	**6**	**400**	-	**800**

Elective I

1.2K6 EC 606(A) : DESIGNING WITH VHDL

2.2K6 EC 606(B) : HIGH SPEED DIGITAL DESIGN

3.2K6 EC 606(C) : LINEAR SYSTEMS ANALYSIS

4.2K6 EC 606 (D) : DATA STRUCTURES & ALGORITHMS

5. 2K6EC 606(E) : ANALOG MOS CIRCUITS

2K6 EC 501: ENGINEERING MATHEMATICS – IV

3 hours lecture and 1 hour tutorial per week

Module I: Probability distributions (13 hours)

Random variables - Probability distributions - binomial distribution -Poisson distribution-normal distribution – Mean, variance and Moment generating function - Poisson process - chebyshev's theorem - Geometric Distribution - Uniform Distribution, Gamma distribution, Beta Distribution, Exponential Distribution and Hyper - Geometric Distributions.

Module II: Statistical inference (13 hours)

Population and Sample-Sampling Distributions of Mean and Variance-Point Estimation-Interval Estimation -Null Hypotheses and Significance tests-Hypotheses concerning one mean- Confidence Intervals of mean and variance -Estimation of Variances-Hypotheses concerning one variance-Hypotheses concerning two variance- Chi square test as test of goodness of fit.

Module III (Series solutions of differential equations (13 hours)

Power series method of solving ordinary differential equations - series solution of Bessel's equation – Recurrence formula for Jn(x) - expansions for J_0 and J_1 – value of $J_{1/2}$ - generating function for Jn(x) - Orthogonality of Bessel functions - Legendre's equation – series solution of legendary's differential equation - Rodrigues formula - Legendre Polynomials – Generating function for Pn(x)- Recurrence formulae for Pn(x) - Orthogonality of Legendre polynomials

Module IV Quadratic forms and Fourier transforms (13 hours)

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.

Fourier Transform - Properties of Fourier Transforms – Linearity property - Change of scale property - shifting properties – Modulation property - Transform of the Derivative-simple problems - Fourier Cosine transform - Fourier Sine Transform.

Text Books

Johnson RA, Miller & Freund's Probability and Statistics for Engineers, Prentice Hall of India (For Module I and II only)

Reference Books

1. Wylie CR & Barrett LC, Advanced Engineering Mathematics, Mc Graw Hill
2. Kreyszig E, advanced Engineering Mathematics, John Wiley.
3. NP Bali & Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications
4. Dr.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University Examination Pattern

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

2K6 EC 502: ECONOMICS AND BUSINESS MANAGEMENT

3 hours lecture and 1 hour tutorial per week

Module 1 (12 hours)

Definition of economics – nature and scope of economic science – nature and scope of managerial economics – central problems of an economy – scarcity and choice - opportunity cost – objectives of business firms – forms of business – proprietorship – partnership – joint stock company – co-operative organisation – state enterprise

Module II (14 hours)

Consumption – wants – characteristics of wants – law of diminishing marginal utility – demand – law of demand – elasticity of demand – types of elasticity – factors determining elasticity – measurement – its significance in business – demand forecasting – methods of demand forecasting – supply – law of supply elasticity of supply

Module III (14 hours)

Production – factors of production – features of factors of production – division of labour – production function – Cobb – Douglas production function – production possibility curve – isoquants – marginal rate of technical substitution – properties of isoquants – law of variable proportions – returns to scale – isocost line – least cost combination of factors – expansion path – technical and economic efficiency – linear programming – graphical method – economies of large scale production

Module IV (12 hours)

Market structures and price determination – perfect competition – monopoly – monopolistic competition – oligopoly – kinked demand curve – money and banking – nature and functions of money – money market and capital market – commercial banks – functions – central banking functions – methods of credit control.

Text Books & Reference books

1. Varshney R.L & Maheshwari K.L, Managerial Economics, S Chand & company Ltd.
2. Dwivedi D.N, Managerial Economics, Vikas Publishing House Pvt Ltd.
3. Dewett K.K, Modern Economic Theory, S Chand & Company Ltd.
4. Barthwal A.R, Industrial Economics, New Age International Publishers
5. Benga T.R & Sharma S.C, Industrial Organisation And Engineering Economics, Khanna Publishing
6. Ahuja H.L, Modern Micro Economics – Theory And Applications, S Chand & Company Ltd.
7. Koutsoyiannis A, Modern Microeconomics, Macmillan Press Ltd.
8. Joel Dean, Managerial Economics, Prentice – Hall of India Pvt. Ltd.
9. Dewett. K.K. & Verma J.D, Elementary Economic Theory, S Chand & Company Ltd.
10. Jhingan M.L, Macro Economic Theory, Vrinda Publications Pvt. Ltd.

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University examination pattern

Q I - 8 short answer 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

2K6 EC 503: APPLIED 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 - 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 - 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 equations - solutions for free space conditions - uniform plane wave - sinusoidal time variations - Poynting vector and Poynting 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. John D. Kraus, Electromagnetics, McGraw Hill
2. Mattew N.O. Sadiku, Elements of Electromagnetics, Addison Wesley
3. Edward C Jordan, Keith Balman, Electromagnetic Waves & Radiating Systems, 2nd Ed, PHI
4. David K. Cheng, Field and Wave Electromagnetics, Addison Wesley
5. Hayt W.H., Engineering Electromagnetics, McGraw Hill, Kogakusha
6. Guru & Hiziroglu, Electromagnetic Field Theory Fundamentals
7. 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 answer 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

2K6 EC 504 : COMPUTER ORGANISATION & ARCHITECTURE

3 hours lecture and 1 hour tutorial per week

Module I (15 hours)

Basic structure of computer hardware and software – addressing methods and machine program sequencing- Computer arithmetic- logic design for fast adders- multiplication- Booth's algorithm- Fast multiplication- integer division – floating point number representation – floating point arithmetic

Module II (12 hours)

Control unit – instruction execution cycle – sequencing of control signals – hardwired control – PLAs – micro programmed control – control signals – microinstructions- micro program sequencing- Branch address modification – Prefetching of micro instructions –emulation –Bit slices

Module III (12 hours)

Memory organization – Semiconductor RAM memories-internal organization-Bipolar and MOS devices –Dynamic memories- multiple memory modules and interleaving – cache memories-mapping functions-replacement algorithms-virtual memory –address translation –page tables - memory management units- Secondary memory – disk drives – organization and operations- different standards-RAID Controls

Module IV (13 hours)

Input-output organizations-accessing I/O devices-direct memory access (DMA)- interrupts-interrupt handling-handling multiple devices-device identification-vectored interrupts-interrupt nesting-Daisy chaining-I/O interfaces- serial and parallel standards-buses-scheduling- bus arbitration-bus standards. Introduction to parallel organizations-multiple processor organization- symmetric multiprocessors-cache coherence-non uniform memory access-vector computation- introduction to CISC and RISC-architectures-comparisons

Text Books:

1. Hamacher C.V, "Computer Organisation-4th Edition", Mc Graw Hill, NewYork 1997
2. Stallings William,"Computer Organisation and architecture" 6th Edition Pearson Education 2003

References:

1. Hayes J.P, "Computer Organisation and Architecture-2nd Edition Mc Graw Hill
2. D.A Pattersen and J.L Hennesy "Computer Organisation and Design: The hardware /software Interface 2nd Edition" Harcourt Asia Private Ltd (Morgan Kaufman) Singapore 1998
3. Andrew S. Tanenbaum "Structured Computer Organisation- 4th Edition Pearson Education

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University examination pattern

Q I - 8 short answer 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

2K6 EC 505 : 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., Harry W Li & David E Boyce, '*CMOS- Circuit Design, Layout & Simulation*', PHI
2. Sergio Franco, '*Design with* Operational *Amplifiers and Analog Integrated Circuits*', McGraw Hill Book Company
3. James M Fiore, '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. Robert F Coughlin & Frederick F Driscoll, 'Operational Amplifiers and Linear Integrated Circuits', Fourth Edition, Pearson Education
4. Mark N Horenstein, 'Microelectronic Circuits & Devices', PHI

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University examination pattern

Q I - 8 short answer 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

2K6 EC 506 : MICROPROCESSORS & MICROCONTROLLERS

3 hours lecture and 1 hour tutorial per week

Module I (15 hours)

Intel 8086 processor – Architecture- Pin configuration - Memory addressing - Addressing modes - Instruction set - Assembly language programming - Assemblers - Interrupts - - Timing diagrams - Minimum and maximum mode - Multiprocessor configuration

Module II (12 hours)

Interfacing - Address decoding - Interfacing chips-Architecture and Programming- - Programmable peripheral interface (8255) - Programmable communication interface (8251) - Programmable timer (8254) - DMA controller (8257) - Programmable interrupt controller (8259) - 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 8051 microcontroller –architecture –ports, timers, interrupts, serial data transmission, instruction set -programming

Text books

1. A.K Ray, K.M. Bhurchandi, Advanced Microprocessors and peripherals, 2nd Edition, TMH
2. Ajay V Deshmukh, Microcontrollers theory and applications, TMH
3. Hall D.V., *Microprocessors & Interfacing*, McGraw Hill
4. Brey B.B., *The Intel Microproessors - Architecture, Programming & Interfacing*, Prentice Hall
5. Liu Y.C. & Gibsen G.A., *Microcomputer System: The 8086/8088 Family*, Prentice Hall of India
6. Hintz K.J. & Tabak D., *Microcontrollers-Architecture, Implementation & Programming*, McGraw Hill
7. Myke Predko, Programming and Customising the 8051 Microcontroller,Tata Mc Graw 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. Intel Data Book *EBK 6496 16 bit Embedded Controller Handbook*

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University examination pattern

Q I - 8 short answer 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

2K6 EC 507(P) : LINEAR INTEGRATED CIRCUITS LAB.

3 hours practical 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

Text books

1. Gaykwad, *Operational* Amplifiers, Pearson Education
2. Robert F Coughlin & Frederick F Driscoll, 'Operational Amplifiers and Linear Integrated Circuits', Fourth Edition, Pearson Education
3. D. Roy Choudhary, Shail B. Jain, "Linear Integrated Circuits", New Age International Publishers
4. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', McGraw Hill Book Company

Sessional work assessment

Laboratory practical and record - 35 marks
Tests – 15 marks
Total – 50 marks

2K6EC 508(P) : COMPUTER PROGRAMMING LAB.

3 hours practical per week

Set 1 (3 lab sessions)

C Programming - HCF (Euclid's algorithm) and LCM of given numbers - Conversion of numbers from binary to decimal, hexadecimal, octal and back – Generation of Prime Series and Fibonacci Series - Evaluation of functions like e^x, sin*x*, cos*x* etc. for a given numerical precision using Taylor's series - String manipulation programs: sub-string search, deletion

Set 2 (2 lab sessions)

C Programming - Matrix operations: Programs to find the product of two matrices - Inverse and determinant (using recursion) of a given matrix - Solution to simultaneous linear equations using Jordan elimination. Files: Use of files for storing records with provision for insertion - Deletion, search, sort and update of a record-Pointers-Using Arrays, Linked list, Stacks, Queues

Set 3 (2 lab sessions)

JAVA - String handling programs, Implementation of Inheritance, Polymorphism, Overriding and Exceptions

Set 4 (3 lab sessions)

JAVA- Input/Output File Operations, Applet and Graphic Programming

Reference books

1. Schildt H., *C: The Complete Reference*, Tata McGraw Hill
2. Kelley, Al & Pohl, Ira.,., *A Book on C- Programming in C*, 4th Ed,, Pearson Education
3. Balagurusamy E., Programming with Java: A Primer, 3rd Ed., Tata McGraw-Hill

Sessional work assessment

Lab practical & record	- 35 marks
Tests	- 15 marks
Total marks	- 50 marks

2K6 EC 601 ENVIRONMENTAL ENGINEERING & DISASTER MANAGEMENT

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Multidisciplinary nature of Environmental studies – Definition – scope and importance – need for public awareness

Natural resources – renewable and non-renewable resources – natural resources – forest resources - water resources –

Mineral resources – food resources – energy resources – Land resources – use, overuse and misuse of these resources with appropriate case studies to substantiate – effect on the environment – role of individual in conservation of natural resources – equitable use of resources for sustainable lifestyle.

Module II (12 hours)

Ecosystem – concept – structure and function – producers, consumers & decomposers – energy flow in the ecosystem- Ecological successive food chains - food webs (all in brief)

Ecological pyramids – introduction, types and characteristic features, structure and function of forest, grassland, desert and aquatic ecosystems (ponds, lakes, streams, rivers, oceans and estuaries)Biodiversity and its conservation – Introduction – definition : genetic species and ecosystem diversity – Biogeographically classification of India – value of biodiversity – consumptive and productive use, social, ethical, aesthetic and option values – biodiversity at global, national and local levels – India as a mega-diversity nation – hot spots of biodiversity – threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Module III ((14 hours)

Environmental Pollution – Definition – causes - effects and control measures of: Air Pollution – water Pollution – soil Pollution – marine Pollution – noise Pollution – thermal Pollution – Nuclear hazards.

Solid waste management – causes, effects and control measures of urban and industrial wastes – Role of an individual in preventing Pollution – Environmental Protection Act – Prevention and control of air and water Pollution – Wildlife Protection Act – Forest Conservation Act – Issues involved in Enforcement of Environmental Legislation – Public awareness.

Disaster Management – Principles of disaster management – nature and extent of disasters – natural disasters , hazards, risks and vulnerabilities – man-made disasters – chemical and industrial, nuclear, fire etc. – preparedness and mitigation measures for various hazards – financing relief expenditure – legal aspects - post disaster relief – voluntary agencies and community participation at various stages of disaster management – rehabilitation programmes.

Module IV (10 hours)

Social Issues and the Environment – From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting , watershed management – resettlement and rehabilitation of people ; its problems and concerns, case studies – environmental ethics : Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies – waste land reclamation – consumerism and waste products.

Human population and the environment – Population growth, variations among nations – population explosion – Family welfare programmes – Environment and human health – Pollution hazards, sanitation and health – Human rights for a clean environment – value education – HIV/AIDS – social concern – Women and Child welfare – role of Information Technology in environment and human health – Case studies.

FIELD WORK (5 HOURS)

- Visit to a local area to document environmental assets – river / forest / grassland / hill / mountain
- Visit to local polluted site – urban / rural / industrial / agricultural
- Study of common plants, insects , birds
- Study of simple ecosystems – pond, river, hill slopes, etc.

Text Books

1. Clarke. R.S. Marine Pollution. Clanderson Oress Oxford.`
2. Mhaskar A.K. Matter Hazardous. Techno-Science Publications.
3. Townsend. C., Harper. J. and Michael Begon, Essential of Ecology. Blackwell Science.
4. S. Deswal & A Deswal, A Basic Course in Environmental Studies, Dhanpat Rai & Co
5. Environmental Studies – Dr. B S. Chauhan, University Science Press.
6. Kurien Joseph & R. Nagendran, Essentials of Environmental Studies, Pearson Education.
7. Trivedi. R.K. and Goel. P.K. Introduction to air pollution. Techno-Science Publications.

Reference Books

1. Agarwal.K.C. Environmental biology. Nidi Publ.Ltd. Bikaner.
2. Bharucha erach, Biodiversity of India, Mapin Publishing Pvt.Ltd.
3. Brunner,R.C.. Hazardous Waste Incineration. McGraw Hill Inc.
4. Cunningham W.P., Cooper T.H., Gorhani E. & Hepworth M.T. Environmental Encyclope Jaico Publication House.
5. De A.K. Environmental Chemistry.Wiley Eastern Ltd.
6. Hawkins R.E. Encyclopediaof Indian Natural History, Bombay Natural History Society
7. Heywood V.H. & Watson R.T. Global Biodiversity Assessment. Cambridge Univ. Press.
8. Jadhav H. & Bhosale V.M. Environmental Protection and Laws. Himalaya Pub. House,
9. Odum E.P. Fundamentals of Ecology W.B. Saunders Co.
10. Rao M.N. & Datta A.K. Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd.
11. Sharma B.K. Environmental Chemistry Goel Publ. House, Meerut
12. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances Standards, Vol.I & II.Enviro Media.
13. Wagner K.D. Environmental Management. W.B. Saunders Co.

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University Examination Pattern

Q I - 8 short answer 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

2K6 EC 602: 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 - 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 - 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.

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

Text books & Reference books

1. Benjamin C. Kuo, "Automatic Control Systems", 2nd Edition, Oxford University Press

2. Ogata K., "Modern Control Engineering", 3rd Edition, Prentice Hall India

3. Richard C. Dorf & Robert H. Bishop, "Modern Control Systems", 8th Edition, Addison Wesley

4. Benjamin C. Kuo, "Digital Control Systems", 2nd Edition, 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.

7. Ziemer R.E., Tranter W.H. & Fannin D.R., "Signals and Systems", 4th Edition, Pearson Education Asia

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 answer 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

2K6 EC 603 : 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

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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

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 - 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*
2. John D. Kraus, *Antenna Theory*
3. Constantain A. Balanis, *Antennas*, McGraw Hill

Reference Books

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

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University Examination Pattern

Q I - 8 short answer 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

2K6 EC 604: DIGITAL SIGNAL PROCESSING

3 hours lecture and 1 hour tutorial per week

Module I: Discrete Fourier transform (12 hours)

Discrete Fourier series - properties of DFS - periodic convolution – DTFT and 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: DSP hardware & advanced concepts (12 hours)

Digital Signal Processors – Architecture. General Purpose processors. Special purpose DSP hardwares. Applications and Design aspects. Evaluation boards for real time signal processing. Equalization of digital audio signals. Spectral analaysis of audio signals. Adaptive Digital Filter – Concepts and Applications. Multirate DSP – Concepts. Sampling rate alteration devices. Design of Decimators and Interpolators.

Text & Reference Books

1. Alan V Oppenheim, Ronald W Schafer, John R Buck, “Discrete-time Signal Processing”, 2nd Ed., Prentice Hall Signal Processing Series, Pearson
2. Feacher E C, Jerris B W, “Digital Signal Processing – A Practical Approach”, Addison Wisley
3.Proakis & Manolakkis, “Digital Signal Processing – Principle, Algorithms & Applications”, Prentice Hall India

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University Examination Pattern

Q I - 8 short answer 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

2K6 EC 605: DIGITAL COMMUNICATION

3 hours lecture and 1 hour tutorial per week

Module I (11 hours)

Introduction - block diagram of a digital communication system. Separation of source coding and channel coding. Sources - digital and analog. Sampling Theorem - for lowpass and bandpass signals. Quantization. Channels. Digital Baseband transmission – Pulse Coded Modulation (PCM), Line coding schemes - ON/OFF, NRZ, Bipolar, Manchester signalling, differential encoding. Logarithmic Pulse Coded Modulation (Log PCM) and Companding. DPCM, Delta modulation, Adaptive delta modulation. Spectra of pulse modulated signals. SNR calculation of pulse modulated systems.

Analog Pulse Modulation - Pulse amplitude modulation(PAM), generation and demodulation. PAM/TDM system. Pulse position modulation(PPM), generation and demodulation. Pulse width modulation(PWM).

Module II (12 hours)

Characterization of Noise: Review of Gaussian Random Processes. Probabilistic view of channels. AWGN Channel model.

Characterization of signals: Motivation for signal space analysis - Conversion of continuous AWGN channel into a vector channel. Signal space. Introduction to vector spaces. linear independence, bases, dimension, projection. inner product. distance. norm. orthogonality. Geometric representation of signals. Introduction to L1 and L2 space. Gram-Schmidt orthogonalization procedure.

Communication over bandlimited channels: Pulse Shaping, ISI, Nyquist criterion for zero ISI, signalling with duobinary pulses, eye diagram, equalization, adaptive equalization, scrambling and descrambling

Module III (15 hours)

Communication over Additive Gaussian noise Channels: Maximum Likelihood Detection. MAP detection. The Optimum receicver for AWGN channel. Irrevelent noise. Correlation and Matched Filter recievers. Soft decision and Hard decision. Probability of error. Bit error rate. Optimum reciever for coloured gaussian noise. Carrier and Symbol synchronization.

Module IV (14 hours)

Modulation schems: Coherent binary schemes - ASK, FSK, PSK, MSK. Coherent M-ary schemes - QAM, QPSK, M-ary orthogonal signalling. Calculation of average probability of error for different schemes. Power spectra of modulated signals. Performance comparison of different digital modulation schemes.

Text & Reference Books

1. Simon Haykin, “Communication Systems”, 3rd Ed., John Wiley & Sons
2. Lathi B P, “Modern Digital & Analogue Communication”, 3rd Ed., Oxford University Press
3. Sklar, “Digital Communication”, 2E, Pearson
4. Gallager, Lecture Notes of Principles of Digital Communication, Open CourseWare MIT

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University Examination Pattern

Q I - 8 short answer 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

2K6 EC 606(A): DESIGNING WITH VHDL

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)

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

Module II (14 hours)

Generics. Configurations - specification declaration, default rules, conversion functions, instantiation, and incremental binding. Subprograms - functions and procedures, operator overloading. Packages and libraries – package declaration, package body, design of file, design of libraries. Attributes - user defined and predefined.

Module III (12 hours)

Introduction to test bench generation –waveform generation, wait statement, text file reading and dumping results in text file. Testing – fault models, different faults. Fault simulation- ATPG, DFT, boundary scan, and BIST Top-down design, FSM implementation in VHDL.

Module IV (12 hours)

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

Text & Reference Books

1. Kevin Skahill.: *VHDL for Programmable Logic*, Addison & Wesley.
2. John F. Wakerly: *Digital Design Principles and Practices,* PHI.
3. J Bhasker: *VHDL Primer*, Pearson Education.
4. Nawabi.: *VHDL - Analysis and Modelling of Digital Systems*, 2nd ed., Mc Graw Hill.
5. Douglas Perry: *VHDL*,Mc Graw Hill.
6. VHDL, IEEE Standard Reference Manual.

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University Examination Pattern

Q I - 8 short answer 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

2K6 EC 606(B) : 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 & Reference Books

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

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University Examination Pattern

Q I - 8 short answer 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

2K6 EC 606(C) : LINEAR SYSTEMS ANALYSIS

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

Text & Reference Books

1. Cheng D.K. Addison Wesley, *Linear Systems Analysis*, Addison Wesley
2. Tripati J.N., *Linear Systems Analysis*, New Age International

Sessional work assessment

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University Examination Pattern

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

2K6EC 606(D): DATA STRUCTURES & ALGORITHMS

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 Books

1. 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

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University Examination Pattern

Q I - 8 short answer 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

2K6EC 606(E) : ANALOG MOS CIRCUITS

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

Text & Reference Books

1. Jacob Baker R., Harry W Li & David E Boyce, `*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

Tests (2X15) – 30 marks
Assignments (2X10) – 20 marks
Total – 50 marks

University Examination Pattern

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

2K6 EC 607(P) : COMMUNICATION ENGINEERING LAB

3 hours practical per week

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

Text books

1. Simon Haykin, "Communication Systems", 3rd Ed., John Wiley & Sons

Sessional work assessment

Lab practical & record - 35 marks
Tests – 15 marks
Total – 50 marks

2K6 EC 608(P) : MICROPROCESSOR & MICROCONTROLLER LAB

3 hours practical 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. Sorting algorithms
5. Searching algorithms
6. Interfacing with A/D converters
7. Interfacing with D/A converters
8. PWM motor control circuits
9. Serial communication between two kits
10. General purpose clock design
11. Interfacing with PCs
12. Data acquisition System using 8051 microcontroller
13. Stepper motor control using 8051 microcontroller

Text books

1. A.K Ray, K.M. Bhurchandi, Advanced Microprocessors and peripherals, 2nd Edition, TMH
2. Ajay V Deshmukh, Microcontrollers theory and applications, TMH
3. Hall D.V., Microprocessors & Interfacing, McGraw Hill
4. Brey B.B., The Intel Microproessors - Architecture, Programming & Interfacing, Prentice Hall
5. Liu Y .C. & Gibsen G.A., Microcomputer System: The 8086/8088 Family, Prentice Hall of India
6. Hintz K.J. & Tabak D., MicrocontrollersArchitecture, Implementation & Programming, McGraw Hill
7. Myke Predko, Programming and Customising the 8051 Microcontroller,Tata Mc Graw Hill

Sessional work assessment

Lab practical & record	- 35 marks
Tests	- 15 marks
Total marks	- 50 marks