UNIVERSITY OF CALICUT

SCHEME AND SYLLABI

FOR

THIRD AND FOURTH SEMESTERS

OF

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE & ENGINEERING

FROM 2004 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

CS : COMPUTER SCIENCE & ENGINEERING

THIRD SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hours	Marks
EN04 301B	ENGG. MATHEMATICS-III	3	1	-	50	3	100
CS04 302	DATA STRUCTURES AND ALGORITHMS	3	1	-	50	3	100
CS04 303	DISCRETE COMPUTATIONAL STRUCTURES	3	1	-	50	3	100
CS04 304	BASIC ELECTRONICS ENGINEERING	3	1	-	50	3	100
CS04 305	SWITCHING THEORY AND LOGIC DESIGN	3	1	-	50	3	100
CS04 306	ELECTRIC CIRCUITS AND SYSTEMS	3	1	-	50	3	100
CS04 307(P)	**PROGRAMMING LAB**	-	-	3	50	3	100
CS04 308(P)	**ELECTRONICS LAB**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

FOURTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hours	Marks
EN04 401B	MATHEMATICS-IV	3	1	-	50	3	100
EN04 402	ENVIRONMENTAL STUDIES	3	1	-	50	3	100
CS04 403	SYSTEMS PROGRAMMING	3	1	-	50	3	100
CS04 404	MICROPROCESSOR BASED DESIGN	3	1	-	50	3	100
CS04 405	COMPUTER ORGANISATION AND DESIGN	3	1	-	50	3	100
CS04 406	ELECTRONIC CIRCUITS AND SYSTEMS	3	1	-	50	3	100
CS04 407(P)	**DATA STRUCTURES LAB**	-	-	3	50	3	100
CS04 408(P)	**DIGITAL ELECTRONICS LAB**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

SYLLABI OF THIRD SEMESTER

EN04 301B MATHEMATICS-III

(Common with IT)

3 hours lecture and 1 hour tutorial per week

Module I: Linear Algebra (13 hours)

Vector spaces – Linear dependence and independence, and their computation – Bases and dimension – Subspaces-Gram-Schmidt orthogonalization process – Linear transformations – Elementary properties of linear transformations – Matrix of a linear transformation (Proofs of Theorems are not required)

Module II: Fourier integrals and Fourier transforms (13 hours)

Fourier integral (Proof not required)-Fourier sine and cosine integral representations-Fourier transforms-Fourier sine and cosine transforms-Properties of Fourier transforms-Singularity functions and their Fourier transforms.

Module III: Complex Analytic Functions (13 hours)

Function of a complex variable-Derivative-Analytic function-Cauchy-Reimann equations-Laplace's equation-Conformal mapping-Exponential function – Trigonometric functions-Hyperbolic functions-Logarithm-Linear fractional transformations.

Module IV: Complex Integrals (13 hours)

Line integral in the complex plane – Cauchy's integral theorem (Proof of existence of indefinite integral to be omitted) – Cauchy's integral formula – Derivatives of an analytic functions (Proof to be omitted) – Taylor series – Laurent series – Singularities and zeros – Residue integration method – Evaluation of real integrals.

Text book

Module 1 : K.B. Datta, Matrix and Linear algebra for engineers, Prentice hall of India
Module 2 : Wylie C.R and Barret L.C, Advanced Engineering Mathematics 6th Edition, McGraw Hill
Module 3 : Erwin Kreyszig – Advanced Engineering Mathematics 8th Edition, John Wiley & Sons
Module 4 : Erwin Kreyszig – Advanced Engineering Mathematics 8th Edition, John Wiley & Sons

Reference books

1. R.S.L Srivastava, Engineering Mathematics (Volume II) Tata McGraw Hill
2. S.Narayan, T K Manicavachagom Pillai & Dr. Ramanaiah- Advanced Mathematics for Engineering Students,S Viswanathan Publishers
3. R K Jain & R K Iyengar, Advanced Engineering Mathematics, Narosa Publishing house
4. Lipschutz S, Linear Algebra, Schaum's Outline Series, McGraw Hill

Sessional work assessment	
Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 302 DATA STRUCTURES & ALGORITHMS
(Common with IT04 302)

3 hours lecture and 1 hour tutorial per week

[Objective: Views data as the central resource in computing process and to visualize the importance of structuring data. It describes the impact of organizing data on the efficiency of algorithms that process the data. Static and dynamic data structures, linear and nonlinear data structures are extensively covered and is indispensable in any stream of study in computing.**]**

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

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, 1990
4. Adam Drozdek, Data Structures and Algorithms in C++, Thomson Brooks/cole – Vikas Pub. House pvt. Ltd.
5. Deshpande P.S, Kakde O.G, *C and Data structures*, Dream – tech India Pvt. Ltd.

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 303 DISCRETE COMPUTATIONAL STRUCTURES
(Common with IT04 303)

3 hours lecture and 1 hour tutorial per week

[Objective: This course provides fundamental computational concepts. This course intends to cover basic computational structures and methods such as logic, groups, rings and fields useful for the students of computing sciences stream.**]**

Module 1 (13 hours)

Logic - Logical connectives and Truth tables – Logical equivalence and laws of logic – Logical implication and rules of inference- Quantifiers – Proofs of theorems using rules of universal specification and universal generalization.

Module II (13 hours)

Relational Structures - Cartesian products – Relations – Relation matrices – Properties of relations – Composition of relations- Equivalence relations and partitions- Functions – One-to-one, onto functions – Composition of functions and inverse functions- Partial orders- Hasse diagrams.

Module III (13 hours)

Group Theory - Definition and elementary properties- Cyclic groups- Homomorphisms and Isomorphisms - Subgroups- Cosets and Lagrange's theorem-Elements of coding theory- Hamming metric-Generator matrices-Group codes- Hamming matrices.

Module IV (13 hours)

Rings and Fields - Definitions and examples of rings, integral domains and fields- Elementary properties and substructures - Homomorphisms and isomorphisms – The ring Z_n - Polynomial rings – Irreducible polynomials and finite fields.

Text book

1. Ralph P Grimaldi, *Discrete and Computational Mathematics*: An applied introduction (Fourth Edition), Pearson Education, 2004.

Reference books

1. Tremblay, J P & Manohar,R, *Discrete and Mathematical Structures with Applications to Computer Science*, McGraw Hill Book Company.
2. Kolman B & Busby R C, *Discrete and Mathematical Structures for Computer Science*, Prentice Hall of India.
3. Donald F Stanat & David F Mc Allister, *Discrete and Mathematical Structures in Computer Science*, Prentice Hall.
4. Truss J K, *Discrete Mathematics for Computer Scientists*, Pearson Education, 2001.
5. Herstein I N, *Topics in Algebra*, Wiley Eastern.
6. Garding, L & Tambour T, *Algebra for Computer Science*, Narosa Publishing House, New Delhi.

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Attendance	= 05
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

CS04 304 BASIC ELECTRONICS ENGINEERING
(Common with IT04 304)

3 hours lecture and 1 hour tutorial per week

[Objective: This course is to introduce the Basic Electronic components and concepts as a background information useful for the computing sciences. It covers the principle, properties and characteristics of various analog electronics devices and circuits. For adequacy this has to be complemented by exercises appearing in texts and references.**]**

Module I (15 hours)

Electronic components - Concepts of voltage and current sources - Energy bands in solids, metals, insulators and semiconductors - Intrinsic and extrinsic semiconductors - PN junction theory - V-I characteristics - Diode resistance - Rectifiers - Performance analysis of rectifiers - Filters, zener, varactor and power diodes - LEDs. Transistors - Working and amplifying action - Characteristics - Comparison between CE, CB and CC configurations - CE Amplifier, construction of transistors - Use of data sheet - Thermal runaway - UJT, introduction to FETs

Module II (12 hours)

Transistor biasing - Selection of operating point - Bias stabilization - Different biasing circuits - PNP biasing - Small signal amplifiers - Single stage amplifier - Graphical method - Equivalent circuit method - Amplifier analysis - FET amplifier - Multistage amplifiers - Gain analysis - RC coupled amplifier - Frequency response - Two stage RC coupled amplifier - Distortion in amplifiers - Classification of amplifiers

Module III (13 hours)

Power amplifiers - Single-ended power amplifier - Harmonic distortion - Push-pull amplifier - Tuned voltage amplifier - Resonance - Single-tuned voltage amplifier - Feedback in amplifiers - Types of feedback - Voltage gain with feedback - Negative feedback - Oscillators - Classification - LC oscillators - RC oscillators - Crystal oscillators – A stable multivibrator

Module IV (12 hours)

Operational amplifiers - Inverting and non-inverting amplifiers - Adder - Voltage follower - Differential amplifier - Integrator and differentiator - Zero-crossing detector - Precision diode - Peak detector - Logarithmic amplifier - Square and triangle wave generator - Analog computation - Active filters

Text books

1. Bhargava N.N., Kulshreshtha D.C. & Gupta S.C., *Basic Electronics & Linear Circuits*, Tata McGraw Hill (Modules I, II & III)
2. Nagarath J., *Electronics Analog & Digital*, Prentice Hall India (Module IV)

Reference books

1. Millman J. & Halkias C.C., *Integrated Electronics: Analog & Digital Circuits & Systems*, Tata McGraw Hill
2. Schilling D.L. & Belove C., *Electronic Circuits: Discrete & Integrated*, McGraw Hill

Sessional work assessment	
Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 305 SWITCHING THEORY & LOGIC DESIGN
(Common with IT04 305)

3 hours lecture and 1 hour tutorial per week

[Objective: To introduce the principles, features and properties of digital devices and circuits. This provides the basic concepts of computations and logic designs of Arithmetic Logic Unit (ALU) of a Computer. Books have been carefully chosen to get examples from diverse computing application for practice along with theory**]**

Module I (14 hours)

Number Systems and codes - *Boolean algebra* - Postulates and theorems - Constants, variables and functions - Switching algebra - Electronic gates and mechanical contacts *Boolean functions and logical operations* - Normal and canonical forms - Self-dual functions - Logical operations - *Karnaugh map* - Prime cubes - Minimum sum of products and product of sums - Quine-McClusky algorithm

Module II (13 hours)

Combinational Logic - Analysis and design of combinational logic circuits - Universal property of the NAND and NOR gates – Adders - Parallel adders and look-ahead adders – Comparators - Decoders and encoders - Code conversion - Multiplexers and demultiplexers - Parity generators and checkers - ROMs, PLAs

Module III (10 hours)

Fault diagnosis and tolerance - Fault classes and models - Fault diagnosis and testing - Test generation - Fault table method - Path sensitization method - Boolean difference method - Fault-tolerance techniques. *Programmable logic arrays* - PLA minimization - Essential prime cube theorem - PLA folding - Design for testability

Module IV (15 hours)

Counters and shift registers - SR, JK, D and T flip-flops - Excitation tables - Triggering of flip-flops - Flip-flop applications - Latches - Ripple counters - Synchronous counters - Up-down counters - Design of sequential circuits - Counter decoding - Counter applications - Shift registers and their applications - *Clock mode sequential machine* - *S*tate tables and diagrams

Text books

1. Biswas N.N., *Logic Design Theory*, Prentice Hall of India (modules I, II & III)
2. Floyd T.L., *Digital Fundamentals*, Universal Book Stall (module IV)

Reference books

1. Kohavi Z., *Switching & Finite Automata Theory*, Tata McGraw Hill
2. Millman J. & Halkias C.C., *Integrated Electronics: Analog & Digital Circuits & Systems*, Tata McGraw Hill
3. M.Morris Mano, Charles R. Kime, *Logic and Computer Design Fundamentals*, Pearson Education

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 306 ELECTRIC CIRCUITS AND SYSTEMS

3 hours lecture and 1 hour tutorial per week

[Objective: This course is to introduce the Electric Circuits and Systems useful for the computing technology stream. Being a vast subject, the course can only introduce systems and devices essential for the computing field.]

Module I (12 hours)

Review of basic circuit concepts – Matrix methods & circuit analysis, Mesh current analysis, driving point impedance, transfer impedance, node voltage analysis, driving point admittance, transfer admittance, Coupled circuits - Dot rule for coupled circuits - conductively coupled and equivalent circuits, Definition of graph - trees, Incidence matrix - Properties of incidence matrix, Cut sets – Fundamental cut sets – Cut set schedule, Tie sets – Fundamental tie sets – Tie set schedule, Relationship among incidence matrix - Cut set matrix & Tie set matrix, Kirchhoff's law in terms of network topological methods – Loop analysis – Cut set analysis.

Module II (14 hours)

Single phase circuits - Analysis of a.c circuits using phasor concepts, Concept of impedance - Admittance - Conductance and Susceptance, S domain circuits, Power in a.c circuits, Thevenin's and Norton's theorem, Maximum power transfer theorem, Frequency response.

Polyphic circuits – Three phase circuits with balanced and unbalanced loads (both star and delta), Three wire and four wire systems, Three phase power, Introduction to Power factor in balanced and unbalanced three phase systems,

Module III (12 hours)

Bridge circuits - Principles of Maxwells bridge - Wiens bridge - Adersons bridge and Scherring bridge, Two port networks , Impedance - Admittance and Hybrid parameters, Interconnection of two port networks, Driving point and Transfer functions, Introduction to Poles and Zeros

Module IV (14 hours)

Introduction to systems - Systems engineering- transfer function, System modeling -Block diagrams & its reductions, Control system characteristics, Signal flow graphs. Introduction to dynamic responses, Feedback control systems, first and second order systems, system time constants, Frequency response, Introduction to stability analysis using frequency response(bode plot only) .

Text books

1. I. Nagrath & M. Gopal *Control System Engineering*, Wiley Eastern Ltd.
2. Edminister J.A, *Electric Circuits*, Schaum's Outline Series, McGraw Hill
3. Vaikenberg, *Network Analysis*, Prentice Hall of India

Reference books

1. Kuo F., *Network Analysis & Synthesis*, John Wiley
2. Chang D.K., *Analysis of Linear Systems*.
3. Siskind, *Electrical Circuits*, McGraw Hill

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 307(P) PROGRAMMING LAB

3 hours practical per week

[Objective: This course is to give a strong programming concept so as to introduce the software engineering techniques to the students of computing streams. For adequacy this has to be complemented by exercises appearing in texts and references. Books have been carefully chosen to get examples from diverse computing applications for practice**]**

Set 1 (3 lab sessions)

HCF (Euclid's algorithm) and LCM of given numbers - Find mean - Median and mode of a given set of numbers - Conversion of numbers from binary to decimal, hexadecimal, octal and back - Evaluation of functions like e^x, sin*x*, cos*x* etc. for a given numerical precision using Taylor's series - Testing whether a given number is prime

Set 2 (2 lab sessions)

String manipulation programs: sub-string search, deletion - Lexicographic sorting of a given set of strings - Generation of all permutations of the letters of a given string using recursion

Set 3 (2 lab sessions)

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

Set 4 (3 lab sessions)

Files: Use of files for storing records with provision for insertion - Deletion, search, sort and update of a record

Reference books

1. Schildt H., *C: The Complete Reference*, Tata McGraw Hill
2. Tan H.H. & D'Orazio T.B., *C Programming for Engineering & Computer Science*, McGraw Hill
3. Cormen T.H. et al, *Introduction to Algorithms*, Prentice Hall of India

Sessional work assessment	
Lab practical & record	= 25
Regularity	= 05
2 tests	2x10 = 20
Total marks	= 50

CS04 308(P) ELECTRONICS LAB

3 hours practical per week

[Objective: This course is to give a hand on experience to students in the static and dynamic characteristics of the electronics components and systems. The most fundamental and essential devices and circuits are chosen for this laboratory course.**]**

1. Silicon, germanium and zener diode characteristics
2. Characteristics of UJT and UJT relaxation oscillator
3. Static transistor characteristics in CE and CB configurations
4. Clipping, clamping, differentiating and integrating circuits
5. Series voltage regulator
6. Frequency response of CE amplifier with and without feedback
7. Emitter follower: measurement of input and output impedance
8. RC phase shift oscillator
9. Op amp: inverting and non-inverting amplifier, voltage follower
10. Op amp: differential amplifier

Reference books

1. Millman & Halkias, *Integrated Electronics*, Tata McGraw Hill
2. Bhargava et.al., *Basic Electronic Circuits and Linear Circuits*, Tata McGraw Hill

Sessional work assessment

Lab practicals & record	= 25
Regularity	= 05
2 tests	2x10 = 20
Total marks	= 50

SYLLABI OF FOURTH SEMESTER

EN04 401B MATHEMATICS-IV
(Common with IT04 401)

3 hours lecture and 1 hour tutorial per week

Module I: Probability Distributions (16 hours)

Introduction – Probability distributions – Continuous random variables – Probability density functions – Mathematical expectation – The expected value of a random variable – Moments – Moment generating function – Special probability distributions Binomial distribution – Geometric distribution – Hyper-geometric distribution – Poisson distribution – Special probability densities – Uniform density – Gamma and chi-square distributions – Normal distribution.

Module II: Sampling Distributions & Estimation (10 hours)

Population and samples – The sampling distribution of the mean – The sampling distribution of the variance

Estimation Introduction – Unbiased estimators – Efficiency-Consistency – Sufficiency – The method of maximum likelihood – Interval estimation – The estimation of means – The estimation of variances

Module III: Testing of hypotheses (10 hours)

Tests of hypotheses – Null hypotheses and tests of hypotheses – Hypotheses concerning one mean – Hypotheses concerning two means Hypotheses concerning one variance – Hypotheses concerning two variances – Chi-square test for goodness of fit.

Module IV: Jointly distributed random variables, Markov chains & Poisson processes (16 hours)

Joint distribution functions – Independent random variables – Covariance and variance of sums of random variables – Joint probability distribution of functions of random variables – Stochastic processes – Conditionals probability and conditional expectations

Markov chains-Champman-Kolmogorov equations – Exponential distribution – Properties of exponential distribution – Counting processes – Definition of Poisson process – Inter arrival and waiting time distributions.

Text book

Module 1 : John E Freund, Mathematical Statistics 5th Edition, Prentice Hall of India
Module 2 : Johnson R.A, Miller & Freud's Probability & Statistics for Engineers 6th Edition Pearson Education Asia
John E Freund, Mathematical Statistics 5th Edition, Prentice Hall of India
Module 3 : Johnson R.A, Miller & Freud's Probability & Statistics for Engineers 6th Edition Pearson Education Asia
Module 4 : Ross S.M, Introduction to Probability Models 7th Edition, Academic Press

Reference books

1. Erwin Kreyszig – Advanced Engineering Mathematics 8th Edition, John Wiley & Sons
2. R.E.Walpole, R.H Myers, S.L Myers & Keying, Probability and Statistics For Engineers 7th Edition, Pearson Education Asia
3. Karlin S & Tailor.H, A first course in Stochastic process, Academic Press

Sessional work assessment	
Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

EN04 402 ENVIRONMENTAL STUDIES
(Common for all branches)

3 hours lecture & 1 hour tutorial per week

[**Objective:** The importance of environmental science and environmental studies cannot be disputed. Continuing problems of pollution, loss of forest, solid waste disposal, degradation of environment, loss of bio diversity etc have made everyone aware of environment issues. The objective of this course is to create general awareness among the students regarding these environmental issues.]

Module I (12 Hours)
The Multidisciplinary nature of environmental studies
Definition - scope and importance-need for public awareness.
Natural Resources – Renewable and non-renewable resources:
Natural resources and associated problems - forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their defects on forests and tribal people. - Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies - Land resources: Land as a resource, land degradation, man induced land slides, soil erosion and desertification - Role of an individual in conversation of natural resources - Equitable use of resources for sustainable lifestyle.

Module II (14 Hours)
Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Introduction, types, characteristic features , structure and function of the following ecosystem:-Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystem(ponds, streams, lakes, rivers, oceans, estuaries)
Bio-diversity and its conservation
Introduction – Definition: genetic, species and ecosystem diversity - Biogeographical classification of India - Value of biodiversity: consumptive use, 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 wild life, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Module III (11 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 prevention of pollution - Pollution case studies - Disaster management : floods, earthquake, cyclone and landslides - Environmental Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and Control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation - Public Awareness

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 - Wasteland reclamation - Consumerism and waste products
Human Population and the environment
Population growth, variation among nations - Population explosion – Family welfare Programme - Environment and human health – Pollution hazards, Sanitation and health - Human Rights for 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 book

1. Clark, R.S. Marine Pollution. Clanderson Press Oxford
2. Mhaskar A.K, Matter Hazardous. Techno-science Publications
3. Miller, T.G. Jr. Environmental Science. Wadsworth Publishing Co.
4. Townsend, C., Harper, J. and Michael Begon, Essential of Ecology. Blackwell Science
5. Trivedi. R.K. and Goel . P.K. Introduction to air pollution. Techno – Science Publications

Reference books

1. Agarval. K.C.2001 Environmental biology. Nidi Publ. Ltd. Bikaner
2. Bharucha Erach, Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email: mapin@icenet.net
3. Brunner, R.C. 1989. Hazardous Waste Incineration. McGraw Hill Inc. 480p
4. Cunningham, W.P., Cooper, T.H., Gorhani, E & Hepworth, M.T. 2001Environmental encyclopedia Jaico publ. House Mumbai 1196p
5. De, A.K. Environmental Chemistry. Wiley Eastern Ltd.
6. Down to Earth, Centre for Science and Environment
7. Gleick, H.P. 1993. Water in crisis. Pacific Institute for Studies in Dev., Environment and security, Stockholm Env. Institute. Oxford Univ. Press. 473p
8. Hawkins, R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay
9. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
10. Jadhav, H. & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi
11. Mckinney, M.L. & School, R.M. 1996. Environmental Science system & Solutions, Web enhanced edition, 639p.
12. Odum, E.P. 1971. Fundamentals of Ecology. W.B.Saunders Co. USA, 574p
13. Rao, M.N. & Datta, A.K 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd., 345p
14. Sharma, B.K. 2001. Environmental Chemistry. Goel Publ. House, Meerut.
15. Survey of the Environment, The Hindu (M)
16. Trivedi, R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol I and II . Enviro Media
17. Wagner.K.D. 1998. Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

Sessional work assessment

2 tests	= 20
Field work and report (Internal assessment)	= 25
Regularity in the Class	= 05
Total marks	= 55

University examination pattern

Q I - 16 short type questions (to answer 12 out of 16) of 5 marks each, 4 from each module (12 x 5 = 60 Marks)
Q II - 2 questions of 10marks each from module I with choice to answer any one
Q III - 2 questions of 10marks each from module II with choice to answer any one
Q IV - 2 questions of 10marks each from module III with choice to answer any one
Q V - 2 questions of 10marks each from module IV with choice to answer any one

CS04 403 SYSTEMS PROGRAMMING
(Common with IT04 403)

3 hours lecture and 1 hour tutorial per week

[Objective: The subject gives the essentials of system software design. System software consists of programs necessary to make the hardware function properly. The objective of the study of this subject is to equip the student with the right kind of tools for computer systems design and development.**]**

Module I (15 hours)
Background - system software machine architecture - the simplified instructional computer - traditional machines - RISC machines - *assemblers* - basic assembler functions - machine dependent and machine independent - assembler features - *assembler design* - assembler design options - implementation examples - AIX Assembler

Module II (13 hours)
Loaders and linkers - basic loader functions - machine dependent and machine independent loader features - loader design options and implementation examples - *macro processors* - basic macro processor functions - machine-independent macro processor features - macro processor design options and implementation examples

Module III (15 hours)
Introduction to operating systems - basic principles - batch processing - multiprogramming - timesharing systems and real-time systems - parallel and distributed systems - *computer system structure* - computer system operation - I/O structure - structure - storage hierarchy - hardware protection - general system architecture - *operating system structure* - system components - OS services - system calls - system structure - virtual machines

Module IV (9 hours)
General overview of the UNIX operating system - history of UNIX - system structure - user perspective - services - hardware assumptions - u*nix architecture* - system concepts - kernel data structures - system administration process (concepts only)

Text books
1. Beck L.L., *System Software - An introduction to Systems Programming*, Addison Wesley
2. Bach M.J., *The Design of the Unix Operating System*, Prentice Hall India

Reference books
1. Dhamdhere D.M., *Systems Programminmg and Operating Sytems*, Tata McGraw Hill
2. Godbole S., *Operating Systems,* Tata McGraw Hill

Sessional work assessment

Assignments	2x7.5 = 15
2 tests	2x15 = 30
Regularity	= 5
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

CS04 404 MICROPROCESSOR BASED DESIGN

3 hours lecture and 1 hour tutorial per week

[Objective: This paper is to familiarize the student with the internals of real processor with a wide range of processing capabilities. It also gives a fair idea of various interfacing methods and devices, along with a detailed treatment of important design issues.]

Module I (13 hours)

Historical background of microprocessors - Inside the PC*:* Motherboard - Graphic adapters and monitors - Drive controllers - Floppy and hard disk drives - Streamers and other drives - Parallel interfaces and printers - Serial interfaces and modems - Network adapters and LANs - CMOS RAM and real clock - Keyboard, mouse and other rodents - The power supply - Operating system - BIOS and memory organization - *8086/8088 Hardware specification*: Clock generator - Bus buffering and latching - bus timing - Ready and wait states - Minimum and maximum modes - Advanced processors - Features of 80386, 80486 and Pentium processors

Module II (13 hours)

Microprocessor architecture: Real mode and protected mode memory addressing - Memory paging - Addressing modes - Data addressing - Program memory addressing - Stack memory addressing - Data movement instructions - Arithmetic and logic instructions - Program control instructions - Programming the microprocessor: modular programming - Using keyboard and display - Data conversions - disk files - interrupt hooks

Module III (13 hours)

Memory interface: Memory devices - Address decoding, 8 bit (8088), 16 bit (8086), 32 bit (80486) and 64 bit (Pentium) memory interfaces - Dynamic RAM. I/O interface - Port address decoding - PPI, 8279 interface - 8254 timer interface - 16550 UART interface - ADC/DAC interfaces

Module IV (13 hours)

Interrupts: Interrupt processing - Hardware interrupts - Expanding the interrupt - 8259A programmable interrupt controller - DMA: DMA operation - 8237 DMA controller - Shared bus operation - Disk memory systems - Video displays - Bus interface: ISA bus - EISA and VESA buses - PCI bus

Text book

1. Brey B.B., *The Intel Microprocessors 8086 to Pentium: Architecture, Programming and Interface*, Prentice Hall of India
2. Messmer H.P., *The Indispensable PC Hardware Book*, Addison Wesley

Reference books

18. Ray K. & Bhurchandi K.M., *Advanced Microprocessors & Peripherals*, Tata McGraw Hill
19. Hall D.V., *Microprocessors & Interfacing: Programming & Hardware*, Tata McGraw Hill
20. Miller K., *An Assembly Language Introduction to Computer Architecture using the Intel Pentium*, Oxford University Press
21. Bigelow S.J., *Troubleshooting, Maintaining & Repairing PCs*, Tata McGraw Hill

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Attendance	= 05
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

CS04 405 COMPUTER ORGANISATION & DESIGN

3 hours lecture and 1 hour tutorial per week

[**Objective:** This course lays the foundation for the study of hardware organization of digital computers. It brings out the interplay between various building blocks of computers, without being specific to any particular computer. At the end of the course, the student is expected to gain a fair idea about the functional aspects of each building block in computer design, in the general sense]

Module I (14 hours)

Computer abstraction and technology: Below your program - Under the covers - Historical perspective - Measuring performance - Relating the metrics - evaluating, comparing and summarizing performance - Case study: SPEC95 benchmark – Instructions - Operations and operands of the computer hardware - Representing instructions - Making decision - Supporting procedures - Beyond numbers - Other styles of addressing - Starting a program - Case study: 80x86 instructions

Module II (12 hours)

Computer arithmetic - Signed and unsigned numbers - Addition and subtraction - Logical operations - Constructing an ALU - Multiplication and division - Floating point - Case study: floating point in 80x86

Module III (11 hours)

The processor: Building a data path - Simple and multi-cycle implementations - Microprogramming - Exceptions - Case study: Pentium Pro implementation

Module IV (15 hours)

Memory hierarchy - Caches - Cache performance - Virtual memory - Common framework for memory hierarchies - Case study - Pentium Pro memory hierarchy - Input/output - I/O performance measures - Types and characteristics of I/O devices - Buses - Interfaces in I/O devices - Design of an I/O system

Text book

1. Pattersen D.A. & Hennesy J.L., *Computer Organisation & Design: The Hardware/ Software Interface*, Harcourt Asia

Reference books

1. Heuring V.P. & Jordan H.F., *Computer System Design & Architecture*, Addison Wesley
2. Hamacher, Vranesic & Zaky, *Computer Organisation*, McGraw Hill

Sessional work assessment	
Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 406 ELECTRONIC CIRCUITS & SYTEMS

3 hours lecture and 1 hour tutorial per week

[Objective: This course is to introduce the principles, features and characteristics of switching circuits, logic families, memories and analog communication systems. For adequacy this has to be complemented by exercises appearing in texts and references. **]**

Module I (13 hours)

Diode switch, clipping and clamping circuits - Transistor switch - Bistable multivibrator - Schmitt trigger - Monostable and astable multivibrator - Miller and bootstrap sweep generators

Module II (13 hours)

Logic levels - Concepts of SSI, MSI, LSI and VLSI - Logic families: NOT gate, TTL, ECL, CMOS logic - Interfacing - Comparison of logic families - TTL and MOS flip-flops

Module III (13 hours)

Memories: Basic concepts - Read only memories - Programmable ROMs - Static and dynamic random access memories - Memory expansion - Magnetic bubble memories - Magnetic surface storage devices - CD-ROMs - Special memories - Sample and hold circuit - D/A converters - A/D converters - Timing circuits

Module IV (13 hours)

Communication systems - Need for modulation - External and internal noise - Noise figure definition - Amplitude modulation and demodulation - Frequency and phase modulation - Noise and FM - FM demodulation - TRF and super-heterodyne receivers - Radiation and propagation of electromagnetic waves

Text books

1. Millman J. & Taub H., *Pulse, Digital & Switching Waveforms*, McGraw Hill (Module I)
2. Taub H. & Schilling D., *Digital Integrated Electronics*, McGraw Hill (Modules II & III)
3. Kennedy G., *Electronic Communication Systems*, Tata McGraw Hill (Module IV)

Reference books

1. Nagarath I.J., *Electronics Analog & Digital*, Prentice Hall India
2. Floyd T.L., *Digital Fundamentals*, Universal Book Stall
3. Schilling D.L. & Belove C., *Electronic Circuits: Discrete & Integrated*, McGraw Hill

Sessional work assessment	
Assignments	2x7.5 = 15
Tests	2x15 = 30
Attendance	= 5
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

CS04 407(P) DATA STRUCTURES LAB

3 hours practical per week

[Objective: This course gives hand on experience in viewing data as the central resource in computing process and to visualize the importance of structuring data. It demonstrates the impact of organizing data on the efficiency of algorithms that process the data. Static and dynamic data structures as well as linear and nonlinear data structures are extensively covered. This course is indispensable in any stream of study in computing..**]**

1. *Stack and Queue*: Implementation using arrays and Linked lists
2. *Searching Methods*: Binary search and Hashing
3. *Sorting*: Recursive implementation of Quick Sort and Merge Sort
4. *Binary Search Tree*: Implementation with insertion, deletion and traversal
5. *Infix Expression Evaluation*: Using expression tree
6. *Graph Search Algorithms*: DFS and BFS on a connected directed graph
7. *Minimal Spanning Tree*: Implementation of Kruskal's and Prim's Algorithms
8. *Shortest Path Algorithms*: Dijkstra and Floyd Warshall Algorithms
9. *Disjoint Set operations*: Union and Find using rank and path compression
10. *Applications of Heap*: Priority Queue and Heap Sort

Reference books

1. Cormen T.H., Lieserson C.E. & Rivest R.L., *Introduction to Algorithms*, Prentice Hall of India
2. Sahni S., *Data structures, Algorithms & Applications in C++*, McGraw Hill

Sessional work assessment

Lab practicals & record	= 25
Regularity in the Class	= 05
2 tests	2x10 = 20
Total marks	= 50

CS04 408 (P) DIGITAL ELECTRONICS LAB

3 hours practical per week

[Objective: This course gives hand on experience on digital electronics components and systems; which are fundamental building blocks of the Computer systems. Experiments are structured to cover extensively the characteristic and features of indispensable digital electronic circuits and systems.**]**

1. Verification of truth tables of AND, OR, NOT, NAND, NOR and XOR gates, use for gating digital signals
2. TTL characteristics
3. Verification of the postulates of Boolean algebra and DeMorgan's theorem using logic gates
4. Half and full adders, half and full subtractors
5. Digital comparator, parity generator and checker, and code converter
6. Characteristics and operations of RS, gated RS, D, T, and JK master slave flipflops
7. Multiplexer and demultiplexer using gates
8. Shift register, ring counter, and twisted ring counter
9. Decade counter and variable modulo asynchronous counter
10. Astable multivibrator and schmitt trigger using gates, astable and monostable multivibrator and frequency divider using 555

Reference books

1. Nagarath J., *Electronics Analog & Digital*, Prentice Hall India
2. Millman & Halkias, *Integrated Electronics*, Tata McGraw Hill

Sessional work assessment	
Lab practicals & record	= 25
Regularity in the Class	= 05
2 tests	2x10 = 20
Total marks	= 50