Revised course structure & syllabus of the Department of Computer Science, AUS
for Five years Integrated M. Sc. Program in Computer Science w.e.f July, 2016 academic session.

1. The M. Sc Integrated course in Computer Science is a full time regular course & shall be comprising of 10th Semester of full time study & evaluation.
2. There will be option of lateral entry to the course for eligible candidate in the 7th semester of the course through the prescribed admission procedure of the University name the written admission test & personal interview. At the end of successful completion of the prescribed duration of studies such a student shall be awarded the conventional M. Sc. Degree in Computer Science of the University two years duration.
3. There will be an option of lateral exit from the course for the students after successful completion of studies up to the 6th semester of the Integrated M. Sc course. Students who exercise EXIT OPTION at the end of three year (6th semester) of the M. Sc. Integrated course will be awarded B. Sc. Computer Science degree certificates.
4. Students who do not exercise exit option will be given two degree certificate B. Sc. & M Sc. At the end of 5 year after successful completion of study.
5. For a student to get to the 7th semester of the Integrated M. Sc. Course in computer science, He/ She must successfully complete/ pass in all the paper upto the 6th semester of the M. Sc. Integrated course as is currently followed in the Department.
6. Admission of students of the 1st semester of M. Sc. (Integrated) computer science course:
7. Same as the existing rule of the University for M. Sc. integrated course in computer science.
8. Admission of students through lateral entry in the 7th semester of M. Sc. Integrated course in computer science:
9. Same as the existing rule of the University for Admission to the M. Sc. two years course in computer science.
10. Examination & Evaluation: As per University.
11. For term paper & project there will be two reviews in the semester prior to the final evaluation at the end of the semester.

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SEMESTER:I

Course Code	Course Name	L	T	P	C	Sessional Marks	End Semester Marks	Total Marks
MCS-101	Communicative English	4	2	..	6	30	70	100
MCS-102	Mathematics-I	4	2	..	6	30	70	100
MCS-103	Digital Logic and Switching Theory	4	2	..	6	30	70	100
MCS-104	Introduction to Programming Languages	4	2	..	6	30	70	100
MCS-105	Lab on Digital Logic and Switching Theory			6	3	15	35	50
MCS-106	Lab on programming Languages			6	3	15	35	50

SEMESTER: II

Course Code	Course Name	L	T	P	C	Sessional Marks	End Semester Marks	Total Marks
MCS-201	Programming in C	4	2	..	6	30	70	100
MCS-202	Statistical Methods and Applications	4	2	..	6	30	70	100
MCS-203	Computer Organization & Architecture	4	2	..	6	30	70	100
MCS-204	Scientific Computation	4	2	..	6	30	70	100
MCS-205	Lab on Programming in C			6	3	15	35	50
MCS-206	Lab on Scientific Computation			6	3	15	35	50

SEMESTER: III

Course Code	Course Name	L	T	P	C	Sessional Marks	End Semester Marks	Total Marks
MCS-301	Environmental Studies	4	2	..	6	30	70	100
MCS-302	Mathematics – II	4	2	..	6	30	70	100
MCS-303	Data & File Structure	4	2	..	6	30	70	100
MCS-304	Microprocessor and Assembly Language Programming	4	2	..	6	30	70	100
MCS-305	Lab on Data & File Structure			6	3	15	35	50
MCS-306	Lab on Microprocessor and Assembly Language Programming			6	3	15	35	50

SEMESTER: IV

Course Code	Course Name	L	T	P	C	Sessional Marks	End Semester Marks	Total Marks
MCS-401	Data Communications and Computer Networks	4	2	..	6	30	70	100
MCS-402	Discrete Mathematics	4	2	..	6	30	70	100
MCS-403	Data Base Management Systems	4	2	..	6	30	70	100
MCS-404	Object oriented Programming with C++	4	2	..	6	30	70	100
MCS-405	Lab on Data Base Management Systems			6	3	15	35	50
MCS-406	Lab on Object oriented Programming with C++			6	3	15	35	50

SEMESTER: V

Course Code	Course Name	L	T	P	C	Sessional Marks	End Semester Marks	Total Marks
MCS-501	Internet Technologies	4	2	..	6	30	70	100
MCS-502	Modeling and Simulation	4	2	..	6	30	70	100
MCS-503	Operating Systems and Architecture	4	2	..	6	30	70	100
MCS-504	Programming in Java	4	2	..	6	30	70	100
MCS-505	Lab on Operating Systems and Architecture			6	3	15	35	50
MCS-506	Lab on Programming in Java			6	3	15	35	50

SEMESTER: VI

Course Code	Course Name	L	T	P	C	Sessional Marks	End Semester Marks	Total Marks
MCS-601	System Analysis and Design	4	2	..	6	30	70	100
MCS-602	Computer Graphics	4	2	..	6	30	70	100
MCS-603	Systems Software	4	2	..	6	30	70	100
MCS-604	Advance Database Management Systems	4	2	..	6	30	70	100
MCS-605	Project Work			12	6	30	70	100

SEMESTER: VII

Course Code	Course Name	L	T	P	C	Sessional Marks	End Semester Marks	Total Marks
MCS-701	Theory of Computation	4	2	..	6	30	70	100
MCS-702	Wireless and Mobile Computing	4	2	..	6	30	70	100
MCS-703	Artificial Intelligence	4	2	..	6	30	70	100
MCS-704	Design and Analysis of Computer Algorithms	4	2	..	6	30	70	100
MCS-705	Lab on Artificial Intelligence			6	3	15	35	50
MCS-706	Lab on Design and Analysis of Computer Algorithms			6	3	15	35	50

SEMESTER: VIII

Course Code	Course Name	L	T	P	C	Sessional Marks	End Semester Marks	Total Marks
MCS-801	Digital Image Processing	4	2	..	6	30	70	100
MCS-802	Principles of Compiler Design	4	2	..	6	30	70	100
MCS-803*	Open Course-I (a) Programming in C (b) Object Oriented Programming with C++ (c) Programming in Java (d) Internet Technologies	4	2	..	6	30	70	100
MCS-804*	Open Course-II (a) Artificial Neural Networks (b) Mobile Ad Hoc Networks (c) Natural Language Processing	4	2	..	6	30	70	100
MCS-805	Lab on Digital Image Processing			6	3	15	35	50
MCS-806	Lab on Principles of Compiler Design			6	3	15	35	50

SEMESTER: IX

Course Code	Course Name	L	T	P	C	Sessional Marks	End Semester Marks	Total Marks
MCS-901	Software Engineering	4	2	..	6	30	70	100
MCS-902	Term Paper and Grand Viva	..	..	..	6	30	70	100
MCS-903	Data Mining and Knowledge Discovery	4	2	..	6	30	70	100
MCS-904	Elective-I a) Advanced Operating System b) Computer Vision c) Advance Java Programming d) Distributed Data Base Systems e) Evolutionary Computation f) Machine Learning	4	2	..	6	30	70	100
MCS-905	Lab on Data Mining and Knowledge Discovery			6	3	15	35	50
MCS-906	Lab on Elective-I			6	3	15	35	50

SEMESTER: X

Course Code	Course Name	L	T	P	C	Sessional Marks	End Semester Marks	Total Marks
MCS-1001	Distributed Computing	4	2	..	6	30	70	100
MCS-1002	Fuzzy Set Theory and Applications	4	2	..	6	30	70	100
MCS-1003	Elective-II a) Computational Geometry b) Clustering and Grid Computing c) Pattern Recognition d) Quantum Computation e) Embedded Real Time Systems f) Digital Signal Processing g) Advanced Computer Architecture and Parallel Computing h) VLSI Design i) Cryptography j) Operations Research and Optimization Techniques	4	2	..	6	30	70	100
MCS-1004	Project work			24	12	60	140	200

The students are required to choose one option for each of the courses from the list of Elective
However, offering of a particular subject will depend on the availability of Expertise.

L: Lecturer Hrs/Week T: Tutorial P: Practical Hrs/Week C: Credits S:Sessional Marks
E: End Semester Marks TM: Total Marks CBC choice Based Course
Total Marks / Semester – 500

*MCS 803 is open choice course for student other than Computer Science Department. Student from
. Computer Science Department will opt paper from other department.
*MCS 804 is open choice course.

MCS-101: Communicative English

As prescribed in Assam University Undergraduate courses in the P.G department.

Text /references:

AS prescribed in Assam University Undergraduate courses in the P.G department.

MCS-102: Mathematics-I

UNIT-I:

Set theory and Functions: set, subset, union of sets, intersection of sets, difference of two sets, symmetric difference of two sets, van diagram, De-Morgan laws, distributive property, Cartesian product, function, one-one function, onto function, bijective function, composition of functions and inverse function.

UNIT-II:

Matrix Theory: Symmetric and skew symmetric matrices, Hermitian and skew-Hermitian matrices, minor and cofactors, orthogonal and singular matrix, adjoint and inverse of matrices, application of matrices for solving linear system of equation, rank of a matrix, eigen values, eigen vectors, characteristic equation of a matrix, Caley-Hamilton theorem and its use for finding inverse of matrices.

UNIT-III:

Vector Analysis: Introduction of vectors, Vector equation of straight line, plane, circle and spheres, Scalar product of two vectors, Vector product of two vectors, scalar triple product, vector triple product, directional derivative, divergence and curl of vectors, linear dependent and independent of vectors.

UNIT-IV:

Differential Equation: order and degree of differential equation, linear equation, Solution of first order linear differential equation by variable separable method, Homogeneous equations, linear equations, exact equations, Higher order linear differential equation with constant coefficients, Method of undetermined coefficients and Variation of parameters.

UNIT-V:

Laplace transforms, Fourier series and Fourier transforms, Integral transforms.

Text Books/ References:

1. Vector Algebra: Shanti Narayan & PK Mittal, S. Chand & Co. Ltd.,2005.

2. Higher Algebra: Abstract & Linear- S.K. Mapa, Sarat Book House, 2003.

3. Ordinary Differential Equations With Applications and Historical Notes: G.F. Simmons, Tata McGraw Hill, Second Edition.

MCS-103: Digital Logic and Switching Theory

UNIT-I:

Number Systems & Codes: Philosophy of number systems – complement representation of negative numbers, binary arithmetic- addition ,subtraction ,multiplication ,division, binary codes conversion-binary to decimal, binary to hexadecimal. Binary to octal, octal to binary, hexadecimal to binary, floating point representation.

UNIT-II:

Boolean Algebra and Switching Functions: Fundamental postulates of Boolean Algebra - Basic theorems and properties - switching functions–Canonical and Standard forms-Algebraic simplification digital logic gates, properties of XOR gates –universal gates-Multilevel NAND/NOR realizations.

Minimization of Switching Functions: Map method, Prime implicants, Don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime –Implicant chart, simplification rules.

UNIT-III:

Combinational Logic Design: Design using conventional logic gates, Encoder, Decoder, Adders, Substractors Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions Parity bit generator, Code-converters, Hazards.

UNIT-IV:

Sequential Circuits - I: Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples) Basic flip-flops-Triggering and excitation tables. Steps in synchronous sequential circuit design. Design of modulo-N Ring & Shift counters, Serial binary adder, sequence detector.

UNIT-V:

Programmable Logic Devices, Threshold Logic: Basic PLD's-ROM, PROM, PLA, PLD Realization of Switching functions using PLD's. Capabilities and limitations of Threshold gate, Synthesis of Threshold functions, Multigate Synthesis.

TEXTBOOKS:

1. Switching & Finite Automata theory – ZviKohavi, TMH,2nd Edition.
2. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.

REFERENCES:

1. An Engineering Approach To Digital Design – Fletcher, PHI. Digital Logic – Application and Design – John M. Yarbrough, Thomson.
2. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 5th Edition, 2004.
3. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006.
4. Malvino A.P, Digital Principles and Applications, Tata McGraw Hill**.**

MCS-104: Introduction to programming Languages

UNIT-I:

Basic Concepts of Computer Systems: Architectural overview, Data storage and representation Computing environments, Computer languages. Systems Software: Operating systems, editors, compilers, Program linking, loading, and execution, The Internet and electronic mail. Problem Solving Concepts: Strategies for problem solving, Algorithm representation.

UNIT-II:

Numericals Input/output: Introduction, unformatted and formatted input output, formatted input and input field specifications, literal field, records, multiple records, slash, reception factor, simple complete program. Transfer of Control, flowcharts introduction, unconditional transfer, relation expression, Logical IF statement, Controlling a loop, Arithmetic IF statement, Computed GOTO statement algorithms.

UNIT-III:

DO Loops Introduction, CONTINUE statement, simple uses of the DO statement, DO statement, rules on the use of the DO loops, exit from a DO loop, transfer within and to a DO loop, Necessity of the CONTINUE statement, nested DO loops. Arrays and Subscripted variables. Introduction, one-dimensional arrays, DIMENSION statements, arithmetic expressions for subscripts, examples using DO loops, programming techniques example.

UNIT-IV:

Functions and Subroutines: Introduction, FUNCTION subprograms, calling FUNTION subprograms, , FUNCTION subprograms computing several values, Arrays and FUNCTION subprograms, variable dimensions, arithmetic statement function, subroutines, subroutine Vs function. Programming techniques and numerical calculations: Introduction, storing, merging, searching, update, vectors and matrices, linier equations.

UNIT-V:

Character Information, logical variables and operations: Introduction, sorting character, A-Field, manipulating character information, H-Field, Logical constants and logical variables, logical operators and logical expressions, assigning logical values, L-Fiels, hierarchy of operation, execution-time format, ASSIGN, COMMON and EQUIVALANCE statements.

Text Books:

1. Computer programming in FORTRAN 90 – Rajaraman, PHI
2. Computing System Fundamentals – Danhof, Addision Wesley, 1981

References

1. Theory and Problems of Programming with FORTRAN 77 – William E. Mayo & Martin
2. Computer programming in FORTRAN 77, 4th edition – Rajaraman, PHI
3. How to solve it by Computer – Dromey G. Prentice Hall, 1985
4. Computer programming with FORTRAN 77/90 – Gnover, Allied Publishers
5. programming with FORTRAN 77 – Ram Kumar, TMH

MCS-105: Lab on Digital Logic and Switching Theory

Following are some samples for laboratory programming assignments but the assignments should not be limited to these only.

To study:-

01: The digital board DB-01 and to verify the truth tables for AND, OR, NOT, NAND, NOR and XOR gates.
02: The digital board DB-02 and to verify the truth tables for Universal gates (NAND, NOR).
03: The digital board DB-03 and to implement EX-OR gate.
04: The digital board DB-04 and analyze De-Morgans' Theorem.
05: The digital board DB-05 and to study the Ex-OR gate implementation for
i) Odd parity generator
ii) Even parity generator
iii) Binary word comparator

06: The digital board DB-06 and to study the code conversion circuits for
i) Binary to gray code
ii) Gray to binary code

07 The digital board DB-07 and to verify BCD to Excess 3 code conversion circuit.
08: The digital board DB-09 and to verify the truth tables for
i) 8 to 3 line encoder
ii) 3 to 8 line decoder

09: The digital board DB-10 and to verify the truth tables for Multiplexer(MUX) & DeMultiplexer (DMUX).
10: The digital board DB-11 and to verify the truth tables for the R-S flip flops, D flip flops, J-K flip flops & T flip flops.

MCS-106: Lab on programming Languages (FORTRAN/PYTHON)

Following are some samples for laboratory programming assignments but the assignments should not be limited to these only.

1. Write a program to
   a) Find sum of a geometric series
   b) Cipher a string
   c) Check whether a given string follows English capitalization rules
   d) Find sum of the following series $1+ ½ + {}^{1}/_{3} +$_____$+{}^{1}/_{20}$
   e) Search whether a given substring exist in an input string or not and then delete this string from input string.
2. Write a recursive program for tower of Hanoi problem
3. The Fibonacci sequence of numbers is 1, 1, 2, 3, 5, 8……. Based on the recurrence relation F(n)=F(n-1)+F(n-2) for n>2
   Write a recursive program to print the first m Fibonacci number
4. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices
   a) Addition of two matrices
   b) Subtraction of two matrices
   c) multiplication of two matrices

MCS-201: Programming in C

UNIT-I:

Introduction to C: The C character set, identifiers and keywords, data types, constants, variables and arrays, C Instructions, expressions, statements, symbolic constants. Arithmetic operator: Unary operators, library functions, data input/output, preparing and running complete C program. Control statements: preliminaries, the WHILE, DO-WHILE, FOR, IF-ELSE, SWITCH, BREAK, CONTINUE, GOTO STATEMENTS, nested loops,

UNIT-II:

Functions and Pointers: Fundamental of pointer , pointer declarations, , defining a function, accessing a function, function declaration , function prototypes ,passing arguments to a function, specifying arguments data types, passing pointers to a function, recursion.,

UNIT-III:

Arrays and Data Types: Defining an array, processing an array, passing arrays to a function, multi-dimensional arrays, arrays and strings. Program structure, user define data types, storage classes, Automatic Storage Class, Register Storage Class ,Static Storage Class ,External Storage Class .

UNIT-IV:

Structures and Unions: defining a structure, processing a structure, structures and pointers, passing structure to a function, self-referential structure, and union.

UNIT-V:

Data files: Opening and closing a data file, creating a data file, processing a data file, programming with C unformatted data files. multi file programs.
Enumeration, command line parameters, macros, the C preprocessor.

TextBooks/references:

1. Programming with C - E. Balaguruswamy, McGraw Hill (Latest Edition)
2. Programming with C –Gottfried, Schaum's Outline Series (Latest Edition)
3. Let Us C Yashavant P. Kanetkar,BPB (Latest Edition)
4. Programming with C - Rajaraman R, PHI (Latest Edition)
5. Programming with ANSI C - B.T. Holmes, BPB (Latest Edition)
6. The C Programming Language - Kernighan & Ritchie, PHI (Latest Edition)

MCS-202: Statistical Methods & Applications

UNIT-I:

Measures of location, measures of dispersion, skew ness, co-efficient of skew ness, Theory of probability, Axiomatic approach to probability, concept of events, sets, Additional multiplication theorem on probability, conditional probabilities, independent, pair wise independent and mutual independent events and applications, Bay's theorems and applications, Laws of expectations, Moment Generating functions and variance-covariance matrix.

UNIT-II:

Random variables, Discrete and continuous, Probability mass function, probability of function, Joint distribution, P.D.F., conditional distribution and marginal distribution.

UNIT-III:

Theoretical discrete and continuous distributions, Binomial, Poisson, Normal, Beta, Exponential distribution, other discrete distributions (Derivations not necessary).

UNIT-IV:

Correlation, simple, partial and multiple correlations, regression, simple and complex regression, lines of regression, regressive curves and coefficients, Curve fitting by the least squares, Possible solution to system of linear equations by Lagrange's principle squares.

UNIT-V:

Sampling, sampling of attributes, standard errors, sampling distribution, Testing of signal UNIT-izing X,T,F and Z-statics ,analysis of variance –one way and two way classes ,co-variance analysis .

TextBooks/references:

1. Fundamentals of Mathematical Statistics- S. C. Gupta, V. K Kapoor and Saxena ,1996, S Chand & Co. New Delhi
2. Mathematical statistics - Kapoor and Saxena, 1996, S.Chand& Co. New Delhi
3. Statistical methods - S. P. Gupta
4. Statistics - C. B. Gupta
5. Methods and Application -Sanchetti and Kapoor
6. Fundamentals of Applied Statistics - S. C. Gupta and V. K. Kapoor

MCS-203: Computer Organization & Architecture

UNIT-I:

BASIC STRUCTURE OF COMPUTERS: Computer Types, Functional UNIT-s, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers.

REGISTER TRANSFER LANGUAGE AND MICROOPERATIONS: Register Transfer language. Register Transfer, Bus and memory transfer, Arithmetic Microoperations, logic micro operations, shift micro operations, Arithmetic logic shift UNIT-. Instruction codes.Computer Registers Computer instructions – Instruction cycle.Memory – Reference Instructions.Input – Output and Interrupt**.**

UNIT-II:

CENTRAL PROCESSING UNIT: Stack organization. Instruction formats. Addressing modes. DATA Transfer and manipulation. Program control. Reduced Instruction set computer

MICRO PROGRAMMED CONTROL: Control memory, Address sequencing, micro program example, Design of control UNIT--Hard wired control. Micro programmed control

UNIT-III:

COMPUTER ARITHMETIC: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic UNIT-, Decimal Arithmetic operations.

UNIT-IV:

THE MEMORY SYSTEM: Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management hardware

UNIT-V:

INPUT-OUTPUT ORGANIZATION: Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP), Serial communication;

TEXT BOOKS:

1. Computer System Architecture – M.Moris Mano, IIIrd Edition, PHI / Pearson, 2006.
2. Computer Organization – Car Hamacher, ZvonksVranesic, SafwatZaky, V Edition, McGraw Hill, 2002.

REFERENCE:

1. Computer Organization and Architecture – William Stallings Seventh Edition, PHI/Pearson, 2006.
2. Computer Architecture and Organization – John P. Hayes, Mc Graw Hill International editions, 1998.
3. Introduction to computer architecture - Stones S. Galgotia Publication
4. Computer Engineering - Hardware Design - M. Moris Mano, PHI
5. Computer Architecture and parallel processing - Kai Hwang & Faye Briggs, McGraw hill, 1985

MCS-204: Scientific Computation

UNIT-I:

Approximation and Error in Computing: Introduction, Significant digits, different types of error, Absolute and relative error, Error estimation, Floating point arithmetic and Round off error.
Solution of non-linear equations: Bisection's method, Newton-Raphson's Method, Secant's Method.

UNIT-II:

Interpolation: Introduction, Errors in Polynomial Interpolation, Finite differences: Forward Differences-Backward differences, Differences of a polynomial, Newton's formulae for interpolation, Central difference interpolation Formulae – Gauss Central Difference Formulae, Lagrange's Interpolation formula.

UNIT-III:

Solution of linear system: Matrix inversion method, Gauss Elimination, Gauss-jordan method.
Curve Fitting: Fitting a straight line, Second degree curve-exponentional curve-power curve by method of least squares.

UNIT-IV:

Numerical Differentiation and Integration: Cubic splin method, Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.
Partial differential equation: Laplace's equation- Jacobi's Method- Gauss seidel method.

UNIT-V:

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods, Predictor-Corrector Methods, Adams-Moulton Method, Milne's Method.

Text Books/References:

1. Balagurusamy, E., "Numerical Methods", Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.
2. D.Kincaid, W.cheney,"numerical Analysis",Brooks/Cole Publishing Company, California,2001.
3. S.S. Sastry, "Introductory Methods of Numerical Analysis", PHI learning Pvt Ltd, 5th Edition 2010.
4. Computer Oriented Numerical Methods - Rajaraman, PHI
5. Numerical Computations - Venkataraman

MCS-205: Lab on Programming in C

Following are some samples for laboratory programming assignments but the assignments should not be limited to these only.

1. Write a program to
   a) Produce ASCII equivalent of given number
   b) Find divisor or factorial of a given number.
   c) Evaluate the following algebraic expressions after reading necessary values from the user
      _ (ax+b)/ (ax-b)
      _ 2.5 log x-cos 30+$|x^2-y^2|$+sqrt (2xy)
      _ $(x^5+10x^4+8x^3+4x+2)$
   d) Find sum of a geometric series
   e) Cipher a string
   f) Check whether a given string follows English capitalization rules
   g) Find sum of the following series 1+ ½ + $^1/_3$ +_____+$^1/_{20}$
   h) Search whether a given substring exist in an input string or not and then delete this string from input string.
2. Write a recursive program for tower of Hanoi problem
3. The Fibonacci sequence of numbers is 1, 1, 2, 3, 5, 8……. Based on the recurrence relation F(n)=F(n-1)+F(n-2) for n>2
   Write a recursive program to print the first m Fibonacci number
4. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices
   a) Addition of two matrices b) Subtraction of two matrices
   c) Finding upper and lower triangular matrices
   d) Trace of a matrix
   e) Transpose of a matrix
   f) Check of matrix symmetry
   g) Product of two matrices.
5. Write a program that takes two operands and one operator from the user perform the operation and then print the answer
6. Write a program to print the following outputs:

```
1                                   1
2 2                                   2   2
3 3 3                               3   3   3
4 4 4 4                           4   4   4   4
5 5 5 5 5                       5   5   5   5   5
```

7. Write functions to add, subtract, multiply and divide two complex numbers (x+iy) and (a+ib) Also write the main program.
8. Write a menu driven program for searching an sorting with following options:-
   a) Searching (1) Linear searching (2) Binary searching
   b) Sorting (1) Insertion sort (2) Selection sort
9. Write a program to copy one file to other, use command line arguments.
10. Write a program to mask some bit of a number (using bit operations)
11. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.

MCS-206: Lab on Scientific Computation

Problems related to scientific computation should be solved by using the high level programming language C (preferably on Unix/Linux/Solaris operating systems on a network).Following are some sample laboratory programming assignments but the assignments should not limited to these only.

Write an algorithm and a C program to

1. Find the roots of a given equation using:
   a. Bisection Method.
   b. Regula Falsi Method.
   c. Newton Raphson Method.
   d. Secant Method.
2. Find f(x) for a given set of experimental data using
   a. lagrange interpolation.
   b. Newton's forward interpolation.
   c. Newton's backward interpolation.
3. Fit a given set of data in a
   a. straight line.
   b. parabola.
   c. curve of the form $y=ax^2+b$.
   d. curve of the form $y=ax^b$.
   e. curve of the form $y=ae^{bx}$.
4. Find the numerical solution of a system of linear equation using
   a. Gauss elimination.
   b. Gauss Jacobi.
   c. Matrix Inversion.
   d. Gauss Seidal.
5. Perform differentiation applying
   a. Taylor Series.
   b. Euler's method.
   c. Runga-Kutta method
   d. applying Laplace's equation.
   e. Jacobi's Method.
   f. Gauss seidel method.
   g. Trapezoidal Rule.
6. Perform numerical Integration applying Simson's 1/3 Rule.

MCS-301: Environmental Studies

As prescribed in Assam University undergraduate courses in PG departments

MCS-302: Mathematics- II

UNIT-I:

Differential Calculus: Limit, Cauchy's criteria for existence of limits (without proof), problems on limit, Continuity: $\varepsilon - \delta$ definition of continuity, problems on continuity, bounded functions, properties of continuous and bounded functions.

UNIT-II:

Differentiability: $\varepsilon - \delta$ definition of derivative, relation between continuity and differentiability, Intermediate value theorem, Rolle's Theorem, mean value theorem, L'Hospital rule and Taylor's theorem.

UNIT-III:

Successive differentiation, Leibnitz theorem, curvature, asymptotes, singular points, Functions of several variables: partial derivative, total differentials, Euler's theorem of homogeneous function of two variables, Jacobian, maxima, minima, necessary and sufficient condition for maxima and minima.

UNIT-IV:

Sequence: Convergent sequence, monotone sequence, subsequences and Bolzano-Weierstrass theorem, Cauchy criterion for convergence of sequence and divergent sequences.
Series: Convergence and absolute convergence of series, limit comparison test, root test, ratio test, integral test, raabe's test, alternating series test and tests for nonabsolute convergence of a series.

UNIT-V:

Integral Calculus: definition and properties of definite integrals, Riemann integrable functions, Fundamental theorem, Area bounded by plane curves, Volumes and surfaces of solid of revolution about axis .

Text Books/ References:

1. Introduction To Real Analysis: Bartle &Sherbert, Wiley Student Edition, Third edition.

2. Integral Calculus: Das & Mukherjee, U.N. Dhur Publishers, 1998.

3. Differential Calculus: Das & Mukherjee, U.N. Dhur Publishers, 1975.

MCS-303: Data and File Structure

UNIT-I:

Introduction: Data Structures, Data Structures operation, Arrays, Multidimensional arrays, Representation of array in memory, address calculations, sparse arrays.
Lists: sequential and linking structures, circular lists, doubly linked lists, inverted lists, threaded lists, operations on all these structures and applications.

UNIT-II:

Stacks and Queues: Operations on Stack and Queues and their implementations, Applications of Stacks: Polis Notation, Applications of Queues, and Types of Queues: Priority Queue, Circular queue, Double Ended Queue, Implementation of stacks & queues using linked lists, Recursion.

UNIT-III:

Tree Structures: Introduction, binary trees, tree traversal algorithms, threaded trees, binary search trees, AVL search trees, B-trees.

UNIT-IV:

Sorting and Searching: Sequential Sort, Radix sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort, Heap Sort Searching: Sequential Search and Binary Search.

UNIT-V:

Introduction to Graph and Graph Search Techniques, File Organization: serial, sequential, indexed sequential, direct inverted, multi-list, hashing and collision handling methods.

Text Books/ References:

1. Data structures using C -Tenenbum, PHI, 1996
2. Fundamentals of Data Structures HorowitzSahani, Computer Science Press, 1978
3. An introduction to data structures with applications Jean Paul Trembley and Paul Sorenson, McGraw Hill, International Student Edition, 1985
4. Data structures and Algorithms Aefred V. Aho, Jhon E. Joperoft and J.E. Ullman
5. Data Structures, Seymour Lipschutz, Schaum's outlines, Tata McGraw Hill Education Private Ltd.

MCS-304: Microprocessor and Assembly Language Programming

UNIT-I:
Architecture of 8086 Microprocessor. Special functions of General purpose registers. 8086 flag register and function of 8086 Flags. Addressing modes of 8086. Instruction set of 8086. Pin diagram of 8086-Minimum mode and maximum mode of operation. Timing diagram.Memory interfacing to 8086 (Static RAM & EPROM).Need for DMA. DMA data transfer Method. Interfacing with 8237/8257.

UNIT-II:
Assembler directives, simple programs, procedures, and macros.Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation.

UNIT-III:
8255 PPI – various modes of operation and interfacing to 8086.Interfacing Keyboard, Displays, 8279 Stepper Motor and actuators. D/A and A/D converter interfacing.

UNIT-IV:
Interrupt structure of 8086. Vector interrupt table. Interrupt service routines. Introduction to DOS and BIOS interrupts. 8259 PIC Architecture and interfacing cascading of interrupt controller and its importance.

UNIT-V:
Serial data transfer schemes. Asynchronous and Synchronous data transfer schemes. 8251 USART architecture and interfacing.TTL to RS 232C and RS232C to TTL conversion.Sample program of serial data transfer.Introduction to High-speed serial communications standards, USB.

TEXT BOOKS:

1. Advanced microprocessor and Peripherals - A.K.Ray and K.M.Bhurchandi, TMH, 2000.
2. Micro Controllers - Deshmukh, Tata McGraw Hill Edition.
3. Microprocessors Architecture, Programming and Applications - Ramesh S. Goanker, Wiley eastern, 1994 or latest edition

REFERENCES :

1. Micro Processors & Interfacing - Douglas U. Hall, 2007.
2. The 8088 and 8086 Micro Processors - PHI, 4th Edition, 2003.
3. Micro Computer System 8086/8088 Family Architecture, Programming and Design - By Liu and GA Gibson, PHI, 2nd Ed.,
4. Introduction to microprocessors - Aditya P. Mathur, TMH, 1995

MCS-305: Lab on Data & File Structure

(a) **Practical on Data & File Structure**:

Problems related to Data and File Structure should be solved by using the high level programming language C (preferably on Unix/Linux/Solaris operating systems environment on a network).

Following are some sample laboratory programming assignments but the assignments should not be limited to these only.

Write a C program to implement

1. A Link list and perform addition and deletion of elements.
2. A Stack and perform addition and deletion of elements.
3. A Queue and perform addition and deletion of elements.
4. A Circular Queue and perform addition and deletion of elements.
5. Stacks using linked lists.
6. Queues using linked lists
7. A Stack using Queue.
8. A Queue using Stack.
9. Merge two Stacks.
10. Merge two Queues.
11. A tree and perform tree traversal.
12. Perform linear search.
13. Perform binary search.
14. Selection sort.
15. Insertion sort.
16. Bubble sort.
17. Quick sort.
18. Merge sort.

MCS-306: Lab on Microprocessor and Assembly Language Programming

Following are some sample laboratory programming assignments but the assignments should not be limited to these only.

Write an assembly language Program to

1. Perform different modes of operation (HEX KEYPAD/ Serial modes).
2. Examine a series of memory byte locations from 0:1234.
3. Examine and modify memory word location from 500:340.
4. Examine registers.
5. Modify registers DX to 55AA
6. Executing programs and stored at memory location 1000H
7. Converting a hexadecimal number to decimal number.
8. Converting decimal to hexadecimal numbers.
9. Perform hexadecimal addition/subtraction
10. Perform hexadecimal multiplication/division

MCS-401: Data Communications and Computer Networks

UNIT-I:

Overview of data communication and Networking:

Introduction; Data communications: components, Data representation (ASCII,ISO etc.),Direction of data flow(simplex, half duplex, full duplex); Networks: distributed processing, network criteria, Shannon-Hartley Theorem, categories of network (LAN, MAN,WAN);Internet: brief history, internet today; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

UNIT-II:

Physical level: Switching-Circuit switching, packet switching; Network Topology-Bus ,Ring, Star, Mesh, Hybrid , TDM bus;Parallel & serial transmission, Asynchronous & Synchronous transmission.Hammering code, Checksums, Cyclical Redundancy check.

UNIT-III:

Data link layer: Framing- character, bit stiffing; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC;

Medium access layer: Random Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD; Channelization- FDMA, TDMA, CDMA; Controlled access protocol- token pass; Reservation, polling.

UNIT-IV:

Network layer: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing, classful address, classless addressing ,subnetting ,supernetting ; Routing : techniques, static vs. dynamic routing , routing table for classful address; Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP,RARP, IP, ICMP, IPV6;

UNIT -V

Transport layer and Application layer:

Process to process delivery; UDP; TCP; Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets; Quality of service: techniques to improve QoS DNS; SMTP, SNMP, FTP, HTTP

Text Books:

1. B. A. Forouzan – "Data Communications and Networking (3rd Ed.) " – TMH
2. A. S. Tanenbaum – "Computer Networks (4th Ed.)" – Pearson Education/PHI
3. W. Stallings – "Data and Computer Communications (5th Ed.)" – PHI/ Pearson Education

Reference Books:

1. Kurose and Rose – " Computer Networking -A top down approach featuring the internet" – Pearson Education
2. Comer – "Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)" – Pearson Education/PHI

MCS-402: Discrete Mathematics

UNIT-I:

Mathematical Logic: Propositional logic, truth table, propositional equivalence, Argument, Predicates and Quantifiers, Nested quantifiers, Rules of inference, Inference theory of the predicate Calculus.

UNIT-II:

Abstract Algebra: Group, Subgroup, Semigroup, Abelian group, Cyclic group, Lagrange theorem, Normal subgroup, Automorphisms, Homomorphisms, Permutation groups.
Rings: Definition and examples of rings, Simple properties of ring, Integral domain, Skew fields and Field.

UNIT-III:

Lattices and Boolean Algebra with applications: Lattices and partially ordered sets, Bounded lattice, Distributive lattice, Complemented lattice, Boolean Algebra, Boolean functions, Logic gates, Representation and Minimization of Boolean functions and Finite state Machines.

UNIT-IV:

Graph Theory: Basic concepts of graph theory, complete graphs, bipartite graphs, subgraph, Adjacency matrix representation of graph, Incidence matrix of a graph, connected graph, Euler paths and circuits, Hamilton paths and circuits, Dijkstra's Algorithm for shortest path, planar and nonplanar graphs.

UNIT-V:

Trees: Introduction to trees, Rooted tree, Binary tree, Decision tree, Tree Traversal (preorder, inorder, post order traversal), Spanning tree, Depth first search, Breadth first search, Minimum spanning trees, Prim's Algorithm.

Text Books/ References:

1. Discrete Mathematics & Its Applications: Kenneth H Rosen, Tata McGraw Hill, Sixth Edition.

2. Topics in Algebra: I.N. Herstein, Wiley Student Edition, Second Edition.

3. Discrete Mathematics: Richard Johnsonbaugh, Pearson Education, Fifth Edition.

MCS-403: Data Base Management Systems

UNIT-I:

Data modeling for a database: records and files, abstraction and data integration, database management systems; the three levels architecture of a DBMS, components of a DBMS.

UNIT-II:

Data models: Hierarchical, Network model, Relational; ER Diagrams, Extended ER Diagrams, Data base Schema, Keys, Relational Data base: manipulations; relational algebra.

UNIT-III:

Relational calculus, SQL Queries, Relational database design

UNIT-IV:

Normalization and Functional dependencies, findings keys, decomposition computing closures of a FD's Query processing: general strategies for query processing and query optimization, query processor.

UNIT-V:

Transactions and Transaction Processing, ACID Properties, Introduction to Concurrency and Serialization, Concepts of Security and Recovery

Text books/references:

1. Fundamentals of Database System: R. Elmasri& S. Navathe (Benjamin Cummings).
2. Data Base Management System-Henry F. Korth& Abraham Silberschats, McGraw hills, 1991.
3. An introduction to data base management system vol I &II-Date C.J., Addison Wesley, 1981, 1983
4. Principles of data base system -Ullman J.D., computer science ,1982.

MCS-404: Object oriented Programming with C++

UNIT-I:
Introduction to object oriented Modeling, modeling techniques, Object oriented design, object Design, comparison of methodologies (SA/SD, OMT, JSD)

UNIT-II:
Principles of Object Programming, Beginning with C++, Tokens, Expressions and Control structures, Function in C++.

UNIT-III:
Classes and Objects, Constructors, Destructors, Operator Overloading and Type Conversions

UNIT-IV:
Inheritance: Extending Classes, Pointers, Virtual Functions and polymorphism

UNIT-V:
Working with Files. Concepts of Windows and the Microsoft Foundation Class application framework (MFC), MFC class library, Document/View architecture, SDK and MFC architecture, class hierarchy, event handling, and persistent data objects, Designing and implementing projects, user interface, Introduction to Visual C++.

Text books/references:

1. Object-Oriented Programming with C++, E. Balaguruswamy, TMH.
2. Tech yourself C++,Herbert schildt, Osborne Megraw Hill
3. Yashavant. P. Kanetkar, Visual C++ Programming, BPB Publications, 2004.
4. Johnson M. Hart , Windows System Programming - 4th Edition , Addison-Wesley, 2010.
5. Object-Oriented analysis and Design with applications, GrandyBooch
6. C & C++ Complete reference, Herbert Shieldth, Osborne McGraw Hill.
7. Object-Oriented programming in C++,NabajyotiBarkakati, PHI
8. C++ Primer Plus,StephenPrata, Galgotia Publications, 1996
9. C++ The Complete Reference - Herbert Shildt, Osborne McGraw Hill, 1991

MCS-405: Lab on Data Base Management Systems

Database Management System design and implementation problems should form the laboratory assignments for this course. Students should solve assignments by using the standard principles and practices of relational data base design and then develop the appropriate schema for machine implementation on My SQL/SQL/SQLServer/PLSQL/Oracle etc. in Windows/Unix/Linux/Solaris operating systems environment on a network. Following are some samples for laboratory programming assignments but the assignments should not be limited to these only. These programming assignments must be preceded by corresponding database design assignments.

(i) Structured Query Language

1. Creating Database:Creating a Database, Creating a Table, Specifying Relational algebraic constructs, Specifying Constraints, Creating Indexes.

2. Table and Record Handling: INSERT statement, Using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements, DROP, ALTER statements.

3. Retrieving Data from a Database: The SELECT statement, Using the WHERE clause, Using Logical Operators in the WHERE clause, Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING clause, Using Aggregate Functions, Combining Tables Using JOINS, Sub queries.

4. Database Management: Creating Views, Creating Column Aliases, Creating Database Users, Using GRANT and REVOKE, Cursors in Oracle PL / SQL, Writing Oracle PL / SQL Stored Procedures.

MCS-406: Lab on Object Oriented Programming with C++

Programming problems should be solved by using the high level and Object Oriented Programming language C++ (preferably on Unix/Linux/Solaris operating systems environment on a network). Following are some areas of C++ for laboratory programming assignments but the assignments should not be limited to these only.

Write a C++ program for/to

1. Function with default arguments
2. Illustrate the concept of call by value.
3. Illustrate the concept of call by reference.
4. Illustrate the concept of Classes and objects.
5. Create a mark list using arrays..
6. Perform operation on string class.
7. Implement static member function.
8. Display the details of a person using constant member function.
9. Find the largest of three numbers using inline function.
10. Illustrate the concept of unary operator overloading.
11. Illustrate the concept of Binary operator overloading.
12. Illustrate the concept of function overloading.
13. Multiply the positive numbers using single inheritance.
14. Concept of multiple inheritance for collecting employee details.
15. Calculation of areas of different geometrical shapes using virtual functions.
16. Implement the concept of virtual base class.
17. Concept of function template to find the maximum of two datas.
18. Find the greatest of the given two data's using class template.
19. Create and retrieve student data using sequential file access.
20. Create and retrieve student data using random file access.

MCS-501: Internet Technologies

UNIT-I:

Introduction, History of the Internet, Growth of the Internet, Past Decade Protocols, Internet applications, Security aspects, Computational features, Development of Internet in India. Cyber Crimes & Indian Cyber Laws, Internet Traffic Analysis using Wireshark.

UNIT-II:

Building a Corporate Web Sites, Practical Issues on Server and Application Software, Online Services Technology, E-commerce, Payment Gateway, Virtual Reality Applications on the Internet and Intranets, Messengers, Multimedia Communication using Xlite.

UNIT-III:

Internet Structure Protocols and Access Protocols, Router Technology, Gateway Technology, Web Servers-TOMCAT, XAM, FTP Design, Mail Server Design

UNIT-IV:

Hypertext Markup Language (HTML), DHTML, XML, Scripting Languages- Java Script & VB Script. JAVA Servlet Programming(JSP), Active Server Pages (ASP)

UNIT-V:

Web Development tools: Common Gateway Interface (CGI), PHP-My SQL Programs & Web Designs, Enterprise Web Development Tools, Web Database Design & Connection.

Text Books:

1. Daniel Minoli, "Internet and Internet Engineering", TMH
2. Joel Sklar, "Principles of Web Design", Vikas& Thomson Learning
3. Sharma & Sharma, "Developing E-Commerce Sites", Addison Wesley

Reference Books:

1. Keith and Jill, "Active Server Pages", Vikas Publishing
2. Gosslin, "Java Script", Vikas Publishing
3. Horstmann, "Core Java 2, vol I & II", Addison Wesley

MCS-502: Modeling and Simulation

UNIT-I:

Introduction: When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application, Systems and system environment, Components of a system, Discrete and continuous systems, Model of a system; Types of Models, Discrete-Event System Simulation; Steps in a Simulation Study. The basics of Spreadsheet simulation, Simulation example: Simulation of queuingsystems in a spreadsheet.

UNIT-II:

General Principles, Simulation Software: Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling, List processing. Simulation in Java, Simulation in GPSS

Statistical Models in Simulation: Review of terminology and concepts, Useful statistical models, Discrete distributions; Continuous distributions, Poisson process, Empirical distributions.

UNIT-III:

Queuing Models: Characteristics of queuing systems; Queuing notation; Long-run measures of performance of queuing systems; Steady-state behavior of M/G/1 queue; Networks of queues; Rough-cut modelling: An illustration. Queuing models – single and multiserver queues, steady state behaviour of queues, Inventory system simulation

UNIT-IV:

Random-Number Generation, Random-Variate Generation: Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers Random-Variate Generation: Inverse transform technique; Acceptance-Rejection technique;Special properties.

Input Modeling: Data Collection; Identifying the distribution with data;Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate and Time-Seriesinput models

UNIT-V:

Estimation of Absolute Performance: Types of simulations with respect to output analysis; Stochastic nature of output data; Absolute measures of performance and their estimation; Output analysis for terminatingsimulations; Output analysis for steady-state simulations.

Verification, Calibration, and Validation; Optimization: Model building, verification and validation; Verification of simulation models; Calibration and validation of models, Optimization via Simulation

Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 5th Edition, Pearson Education, 2010. (Listed topics only from Chapters1 to 12)
2. NarsingDeo "System Simulation with Digital Computer" PHI pub.

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson Education, 2006.
2. Averill M. Law: Simulation Modeling and Analysis, 4th Edition, Tata McGraw-Hill, 2007.

MCS-503: Operating Systems& Architecture

UNIT-I:

Operating System Architecture: Operating System as an extended machine and resource manager, Operating system classification, Operating system modes and System calls, Processor management functions: process model, process states and transitions, multiprogramming, multitasking, multithreading, CPU scheduling algorithms

UNIT-II:

Memory management functions: memory management of a single user operating system, memory management for multi user operating systems, Logical versus Physical address space, Swapping, Paging, Segmentation, Segmentation with paging, virtual memory.

UNIT-III:

File Management functions: File naming structure , access mechanism , attributes and operations , Directory structure , file protection and security , File space Allocation methods , File sharing , file locking , symbolic links , distributed file system.

UNIT-IV:

Device Management functions: I/O device and controllers, interrupt servicing, system calls, direct memory access , clocks and timers , disk scheduling , device drivers

UNIT-V:

Concurrent Programming: Sequential and Concurrent Processes, The Critical Section Problem,Semaphores , Classical Problems of Synchronization , Critical Regions , deadlock handling , inter process communication.

Text books/references:

1. Operating System Concepts,Silberschatz , Galvin , John wiley and sons
2. Operating Systems,Stallings , Pearson
3. Operating Systems, H.M. Deittel, Pearson
4. Systems Programming,D . M. Dhamdhere , McGraw Hill

MCS-504: Programming in Java

UNIT-I:
Introduction To Java, Basic Features ,Java Virtual Machine Concepts, A Simple Java Program, Primitive Data Type And Variables, Java Keywords, Integer and Floating Point Data Type, Character and Boolean Types, Declaring and Initialization Variables, Type casting ,Java Operators, Expressions, control statements, Arrays.

UNIT-II:
Class Fundamentals, Creating objects ,Assigning object reference variables ,Introducing Methods, Method overloading, Static methods, Constructors, overloading constructors, This Keyword, Using Objects as Parameters, Argument passing, Returning objects ,Method Overriding, Garbage Collection, The Finalize ( ) Method, Inheritance Basics, Access Control ,Multilevel Inheritance, Abstract Classes ,Polymorphism ,Final Keyword, Package, Defining Package, CLASSPATH, Package naming, Accessibility of Packages, Using Package Members, Interfaces, Implementing Interfaces, Interface and Abstract Classes.

UNIT-III:
Exception Handling-try, catch, throw, throws ,Multithreaded Programming- Extands Thread class, Runnable interface , join and is alive method, I/O in Java ,Text Streams, Stream Tokenizer, Buffered Stream , Print Stream, Random Access File, The String Class ,String Buffer Class and Methods.

UNIT-IV:
Applets Programming, Building User Interface with AWT, Swing-based GUI, Layouts and Layout Manager, Container.

UNIT-V:
Event handling – Text filed, Button, Choice List, Radio button, Text area, Java Database Connectivity, Establishing A Connection, Transactions with Database.

Text books/references:

1. Timoth Budd, An Introduction to Object Oriented Programming, Addition Wesly Publishing company(for UNIT--I).
2. Herbert Schildt, The complete Reference, Tata McGraw Hill Publishing company
3. Patrick Naughton and Herbert Schildt, JAVA : the complete Reference, Tata McGraw-Hill Publishing company

MCS-505: Lab on Operating Systems and Architecture

Problems related to Operating Systems and Architecture (with Unix/Linux/Solaris) should be solved by using Programming languages C/C++/ JAVA (preferably on Unix/Linux/Solaris operating systems environment on a network). Further shell programming in UNIX/LINUX should be performed. Following are some areas of Operating Systems and Architecture (with Unix/Linux/Solaris) for laboratory programming assignments/experiments but the assignments should not be limited to these only.

1. Shell Programming
2. Packet Monitoring software (tcpdump, snort, ethereal)
3. Trace route, Ping, Finger, Nmap
4. Server configuration (FTP, SMTP, DNS)
5. NFS Configuration
6. Firewall Configuration using iptables/ipchains(Linux only)

MCS-506: Lab on Programming in Java

Programming problems should be solved by using the high level and Object Oriented Programming language JAVA (preferably on Unix/Linux/Solaris operating systems environment on a network). Following are some areas of JAVA for laboratory programming assignments but the assignments should not be limited to these only.

LIST OF EXPERIMENTS

1. Develop a Java package with simple Stack and Queue classes. Use JavaDoc comments for documentation.

2. Design a class for Complex numbers in Java. In addition to methods for basic operations on complex numbers, provide a method to return the number of active objects created.

3. Design a Date class similar to the one provided in the java.util package.

4. Develop with suitable hierarchy, classes for Point, Shape, Rectangle, Square, Circle, Ellipse, Triangle, Polygon, etc. Design a simple test application to demonstrate dynamic polymorphism.

5. Design a Java interface for ADT Stack. Develop two different classes that implement this interface, one using array and the other using linked-list. Provide necessary exception handling in both the implementations.

6. Write a Java program to read a file that contains DNA sequences of arbitrary length one per line

7. Develop a simple paint-like program that can draw basic graphical primitives in different dimensions and colors. Use appropriate menu and buttons.

8. Develop a scientific calculator using even-driven programming paradigm of Java.

9. Develop a template for linked-list class along with its methods in Java.

10. Design a thread-safe implementation of Queue class. Write a multi-threaded producer-consumer application that uses this Queue class.

11. Develop a multi-threaded GUI application of your choice.

MCS-601: System Analysis and Design

UNIT-I:
The system Concept: Introduction-Characteristics of System, Elements of a system, Types of system. Introduction to system development life cycle, Consideration for candidate system, Prototyping. Roles of system Analyst- The analyst/ user interface, The place of analyst in the MIS.

UNIT-II :
Introduction to system analysis: determining the user's information requirements, problem definition, Background analysis, fact-finding, fact analysis.
Introduction to structured analysis, the tools of structured analysis, Feasibility study; oral representation, Data analysis, Cost/ Benefit analysis, the system proposal

UNIT- III:
Introduction to system designs: The process of design (logical and physical design), Design methodology, structured design, structured walkthrough, Major development activities, Data validation.
Introduction to input design, output design, forms design.
File structure, File organization, Data Base design, and the role of DBA.

UNIT- IV:
Introduction to system testing: The Test Plan, Quality assurance, System Conversion, Post implementation review, Software maintenance.
Procedure for Hardware/Software selection, Project Management and Control, Project Control, Gantt Chart, PERT and CPM.

UNIT-V:
Unified modeling language: Introduction, Use case modeling and UML, developing a use case modeling, The primary elements of UML- Structural things, Behavioral things, Grouping things, Relationships-structural, Behavioral, Diagrams-structural, Behavioral. A proven methodology, the importance of UML for Modeling.

Text Books:

1. Elias. M. Awad, System Analysis and Design, 2nd Ed., Galgotia Publication, 1997.
2. 1. Kendall and Kendall, System Analysis and Design, 8th Ed., PHI, 2008.

References:

1. Igor Hawryszkiewycz, Introduction to System Analysis and Design, 4th Ed., PHI, 2000.
2. Rajib Mall, Fundamentals of Software Engineering, 3rd edition, PHI, 2009.

MCS-602: Computer Graphics

UNIT-I:
Development of computer graphics: Basic graphics systems and standards, Co-ordinate systems, Raster scan and Random scan graphics, Display processors and Character generator, Color display techniques, Frame buffer and bit operation, Concept in raster graphics.

UNIT-II:
Points, lines and curves, Scan Conversion, Line drawing algorithms (DDA, Bresenham's), Circle drawing algorithms (DDA, Bresenham's) and Ellipse generation, Polygon-filling, Conic-section generation, Antialiasing.

UNIT-III:
Two-dimensional viewing: Basic transformations, Windowing and clipping, Segments, Interactive picture construction techniques, Interactive input/output devices.

UNIT-IV:
Three dimensional Concepts: 3-D representations and transformations, Spline curve and surfaces, Fractals, 3-D viewing, Algorithm for 3-D volumes, Hidden lines and Surface rendering.

UNIT- V:
Multimedia and Animations, Introduction to Graphics packages and applications, Morphing, Graphics programming using C++, Keyboard and Mouse Handling Programs.

Text Books:

1. Hearn D., Baker, Computer Graphics with OpenGL, 3rd Edition, Pearson, 2009
2. Malay K. Pakhira, Computer Graphics, Multimedia and Animation, 2nd Edition, PHI, 2010

References:

1. D. F. Rogers and J. A. Adams, Mathematical Elements of Computer Graphics, 2nd Edition, TMH, 1990
2. P. Shirley, M. Ashikhmin, S. Marschner, Fundamentals of Computer Graphics, 3rd Edition, CRC Press, 2009.

MCS-603: Systems Software

UNIT-I:
Introduction, System Software and Machine Architecture. Simplified instructional Computers (SIC)-SIC machine architecture, Data and instruction formats - addressing modes - instruction sets - I/O and programming, SIC /XE Machine Architecture, SIC programming Examples, machine structure with special reference to IBM 360 and 370 system

UNIT- II:
Assembler: Definition, general design procedures ,A simple SIC assembler, Assembler Algorithm & Data Structures , Machine dependent assembler features - Instruction formats and addressing modes , Program relocation, Machine independent assembler features - Literals – Symbol-defining statements , Expressions, Program Blocks, Control Sections and Program Linking.One pass assemblers and Multi pass assembler, Implementation example - MASM assembler.

UNIT-III:
Basic macro processor functions - Macro Definition and Expansion, Macro Processor Algorithm and data structures , Machine-independent macro processor features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor design Options- Recursive Macro Expansion. General purpose Macro Processors, Macro Processing within Language Translators, Macro-Implementation example - MASM Macro Processor – ANSIC Macro language.

UNIT-IV:
Basic loader functions, Design of an Absolute Loader , A Simple Bootstrap Loader, Machine dependent loader features – Relocation, Program Linking, Algorithm and Data Structures for Linking Loader, Machine-independent loader features - Automatic Library Search , Loader Options, Loader design options , Linkage Editors, Dynamic Linking, Bootstrap Loaders - Implementation example - MS-DOS linker.Text Editors - Overview of Editing Process, User Interface, Editor Structure, Interactive Debugging Systems-Debugging Functions and Capabilities, Relationship With Other Parts Of The System

UNIT-V:
Basic Compiler Functions: Grammars, Lexical analysis, Syntactic analysis, Code Generation. Machine Dependent Compiler Features: Intermediate form of the program, Machine Dependent Code Generation Machine Independent Compiler Features: Structured variable, Machine Independent Code Generation, Storage Allocation, Block -Structured Languages.

Lex and Yacc- The Simplest Lex Program, Recognizing Words with LEX, Symbol Tables, Grammars, Parser –Lexer Communication, The Parts of Speech Lexer, A YACC Parser, The Rules Section, Running LEX and YACC. LEX vs. Hand – Written Lexers,

Text books/references:

1. System Software by Leland. L. Beck, Pearson Education
2. Lex and Yacc by John.R.Levine, Tony Mason and Doug Brown, O'Reilly, SPD
3. Systems Programming – John J. Donovan, Tata Mc Graw Hill (Latest edition)
4. Introduction to Systems Software – D. M. Dhamdhere, Tata Mc Graw Hill (Latest edition)

MCS-604: Advance Database Management Systems

UNIT-I:

Basic File Structures, Hashing techniques, RAID technology, Storage Area networks, Indexing Structures for Files: Primary, secondary and clustering indices; Multilevel index, Dynamic Multilevel Indexes using B-Trees and B+-Trees; Algorithms for Query Processing and Optimization – Algorithms for External Sorting, Algorithms for SELECT and JOIN Operations, Algorithms for PROJECT and Set Operations, Heuristics in Query Optimization: Query Trees and Query Graphs, Heuristic Optimization of Query Trees, Converting Query Trees into Query Execution Plans; Using Selectivity and Cost Estimates in Query Optimization, Overview of Query Optimization in Oracle.

UNIT-II:

Overview of Transaction Processing; Concurrent execution of transactions and recovery, Schedules of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Transaction Support in SQL. Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, using Locks for Concurrency Control in Indexes, Concurrency Control Issues. Database Recovery Techniques: Deferred Update, Immediate Update, Shadow Paging, ARIES Recovery Algorithm, Overview of Database Security and related issues.

UNIT-III:

Object Oriented Database Systems: Need for Complex Data Types, Review of the Object-Oriented Data Model and Object-Oriented Languages, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multiset Types in SQL, Reference Types, Object identity and its implementation- Object-Identity and Reference Types in SQL, Persistent Programming Language - Persistent C++ Systems, Persistent Java Systems, Object-Relational Databases**,** Nested Relations, Object-Oriented versus Object-Relational databases.

UNIT-IV:

Data base System architectures: Centralized and Client –Server Architectures, Server System Architectures, Parallel database Systems: Parallel Architectures, Performance measures, shared nothing, shared disk, shared memory based architectures, Data partitioning, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation parallelism, Interoperation Parallelism, Pipelining, Coherence., Scheduling, Load balancing, Design of Parallel Systems.

UNIT-V:

Distributed Database Systems: Types and architectures, Homogeneous and Heterogeneous Distributed Databases, Distributed Data Storage - replication and availability, Data Fragmentation, Replication, and Allocation Techniques, Distributed Query Processing and Optimization- semi-joins, Distributed Transactions , Commit Protocols - 2PC, 3PC, Concurrency Control and Recovery in Distributed Databases, query optimization, Directory Systems, Current Trends in Distributed Databases, Distributed Databases in Oracle.

Text Books:

1. Fundamentals of Database System: R. Elmasri& S. Navathe, Addison-Wesley, 4^{th} - 6^{th} Edition
2. Database System Concepts: H. F. Korth, A. Silberschatz and S. Sudarshan Mc-Graw Hill, 4^{th} - 6^{th} Edition

References Book:

1. Principles of Distributed Database Systems, M. T. Ozsu and P. Valduriez, Pearson Education, First Edition, 2006.

MCS-605: Project Work

Problem oriented projects to be executed in groups under a supervisor from the department. The constitution of groups, problems and topic of the project will be allotted by the Department. Preference is given to projects satisfying present day IT Industry's requirements and government plans. A student group should submit 3 copies of dissertation for evaluation at the end of the semester and present their project as a seminar topic. The external examiner in consultation with the internal examiner shall carry out the adjudication, after giving due weightage to the work carried out in the project, the presentation of the project, and viva voice. The guide/supervisor will be the internal examiner and external shall be appointed from a panel of examiners.

Marks Distribution:

Internal Assessment and Two Midterm Reviews: (20+10) = 30 marks
Dissertation: 50 marks
Presentation and Viva Voce: 20 marks
Total: 100 marks

MCS-701: Theory of Computation

UNIT-I:
Sets, Relations and Functions, Fundamental Proof Techniques, Alphabets, Strings and languages, Finite and Infinite sets, Finite Representation of Languages, Regular Expressions, Deterministic and Nondeterministic Finite Automata (DFA and NFA), Equivalence of DFA and NFA.

UNIT-II:
Properties of the languages Accepted by Finite Automata, State Minimization of a DFA, Pumping Lemma for Regular Sets, Regular and Non-regular languages.

UNIT-III:
Context-free Grammars, Parse Trees, Regular Language and context free language, Chomsky's Normal Form, Pushdown Automata, Properties of Context Free Languages, Pumping Lemma for Context Free Languages, Determinism and Parsing.

UNIT-IV:
The definition of a Turing Machine, Computing with TM, Recursive and Recursively Enumerable Language, Extensions of Turing Machines, Non Deterministic Turing Machines, Chomsky's Hierarchy.

UNIT-V:
Primitive and n-Recursive Function, Church's thesis,
The Halting problem, Unsolvability, Computational Complexity.

Text books/references:

1. H.R.Lewis& C.H. Papadimitriou : Elements of The Theory of Computation, P.H.I.
2. J.E.Hopcroft, R.Motwani&J.D.Ullman : Introduction To Automata Theory, Language and Computation ,Pearson Education
3. K.L.P.Mishra, N.Chandrasekaran: Theory of Computer Science(Automata, Languages And Computation) ,PHI
4. John Martin: Introduction to languages and Theory of Computation, McGraw Hill
5. D.A.Cohen : Introduction To Computer Theory (J.Wiley).

MCS-702: Wireless and Mobile Computing

UNIT-I:

Introduction to Wireless Communication Systems: Evolution of wireless/mobile radio communications, mobile radio systems around the world.

Radio communication systems: paging systems, cordless telephone systems, cellular telephone systems; comparison of common wireless communications, trends in cellular radio and personal communication, second generation (2G) cellular networks, third generation (3G) wireless networks.

Mobile Communications: Need, Requirement and History of Mobile Communications

UNIT-II:

Wireless networking: Properties of Wireless medium, Wireless local area network standards, technology – RF and IR wireless LAN, diffuse, quasi-diffuse and point-to-point IR wireless LAN, advantages and applications of Wireless LAN.

introduction to WI-FI, Bluetooth, 3G & 4G wireless systems.

UNIT-III:

Basics of Mobile Technology: Brief history of Mobile Computing.

Terrestrial cellular telephony: cellular concept, cell cluster, frequency reuse, mobile station (MS), base station (BS), Mobile switching center (MSC).

Different cellular standards: digital cellular systems, TDMA and CDMA systems.Global system for mobile communication (GSM): standard, GSM network, control function, call setup, call handling, mobility management.

UNIT-IV:

Mobile Computing : classification of Mobile data networks, Cellular digital packet data (CDPD) system.

Mobile Internet :IP based mobile system: Architecture and working, General packet radio service (GPRS). Switching and Traffic: intelligent cell concepts, intelligent network communication, and wireless local loop(WLL).

Parameters of Mobile communication systems: Design objectives, Co-Channel Interference Reduction Factor , Adjacent channel Interference, Propagation Attenuation, Fading.

UNIT-V:

Satellite mobile communication: Orbital mechanics and satellite classifications: GEO, MEO, LEO systems.

Global Satellite Communication : working of Gateway links and Inter-satellite Links,Types of Satellite Changeover

Bandwidth compression: principles of FDMA, TDMA, CDMA, SPADE, DMAS.

Global positioning system: basic principles of position fixing with GPS, errors in position fixing, GPS application. Case study on Google earth, VSAT systems.

Text/References:

1. Stallings: Wireless Networks and communication, MGH.
2. T.G. Palanivelu, R.Nakkeeran :Wireless and Mobile Communications PHI
3. Comer, Computer Networks and Internets, PH Int.
4. Black U D, Data Communication and Distributed Networks, PHI

MCS-703: Artificial Intelligence

UNIT-I:

General Introduction of Artificial Intelligence (AI): Intelligent Systems, Brief discussion of Applications of AI (Expert System, Natural Language Processing, Speech and Pattern Recognition etc.), AI Problems, AI Techniques.

Problems, Problem Spaces, and Search: Defining the Problem as a State Space Search, Production Systems, Control Strategies, Problem Characteristics, Issues in the Designing of Search Programs

UNIT-II

Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction

Game Playing: The Minimax Search Procedure, Adding Alpha-Beta Cutoffs, Additional Refinements, Iterative Deepening

UNIT-III:

Knowledge Representation Issues: Representations and Mappings, Approaches To Knowledge Representation

Using Predicate Logic: Representation of Simple Facts in Logic, Representing Instance and isa Relationships, Computable Functions and Predicates, Resolution

Representing Knowledge Using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning

Structured Representation of Knowledge: Slots and Semantic Nets, Frames, Conceptual Dependencies, Scripts

UNIT-IV:

AI Application Areas –

Planning: Components of a Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems

Natural Language Processing: Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing

Expert Systems: Expert System Architecture, Expert System Development Process, Knowledge Acquisition

UNIT-V:

AI languages and their Important Characteristics: PROLOG and LISP, Introduction to Prolog: Syntax and Numeric Function, Basic List Manipulation Functions in Prolog, Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays.

Text Books/References:

1. Artificial Intelligence, E. Rich, K. Knight, S. B. Nair, 3rd Edition, Tata McGraw Hill
2. AI: A Modern Approach, 2nd Edition, S. Russell and P. Norvig, McGraw - Hill
3. Artificial Intelligence, P.H. Winston , 3rd Edition, A. Wesley
4. Introduction to Artificial Intelligence, E. Charniak& D. McDermott, A. Wesley
5. Lisp, Patrick H. Winston & Berthold K. P. Horn, 3rd Edition
6. PROLOG Programming Techniques and Application, S. Garavaglia, Harper and Row
7. Artificial Intelligence and Intelligent Systems – N. P. Padhy, OXFPORD University Press

MCS-704: Design and Analysis of Computer Algorithms

UNIT-I:
Definition of an Algorithm , asymptotic notation: standard notations and common functions, Solution of recurrences: Substitution method, recursion tree method , master method, Stacks and queues , priority queues, heap and heap sort.

UNIT-II:
Divide and Conquer: the general method, binary search , finding the maximum and minimum , merge sort , quick sort , strassen's matrix multiplication,Insertion and deletion in trees

UNIT-III:
Graph Algorithms : Representation of Graphs, breadth first and depth first search, strongly connected components , topological sort , algorithms of Kruskal and Prim, Bipartite Graphs, Maximum matching in Bipartite Graph
String matching algorithms, String matching with finite automata

UNIT-IV:
Dynamic Programming: the general method , multistage graphs, optimal binary search trees, Warshall and Floyd Algorithms, Greedy method-Knapsack problem, Huffman Trees. Iterative Improvement:- the stable matching problem

UNIT-V:
Computational Geometry algorithms: Line segment properties , finding the convex hull , finding the closest pair of points, NP hard and NP Complete problems

Text Books/References:

1. Introduction to Algorithms , Thomas H Cormen et al , PHI
2. Fundamentals of Computer Algorithms , Ellis Horowitz , SartajSahni , Rajasekaran , Universities Press
3. Introduction to Design and analysis of Algorithms , AnanyLevitin , Pearson
4. Algorithm Design , Jon Kleinberg , Eva Tardos , Pearson
5. Fundamentals of Algorithmics , Brassard and Bratley , PHI

MCS-705: Lab on Artificial Intelligence (Lisp/Prolog)

Problems related to Artificial Intelligence should be solved by using the Programming languages PROPOG/LISP. Following are some areas of Artificial Intelligence for laboratory programming assignments but the assignments should not be limited to these only.

1. State Space Search, Production System, Control Strategies
2. Search Technique: Depth-First and Breadth-First Search, First Search, A*, AO* algorithms, Adding Heuristics, Hill-Climbing, Constraint Satisfaction, Game Playing.
3. Knowledge Representation: Predicate and Prepositional Logic, Resolution in Predicate & Prepositional Logic, Deduction and theorem Proving, Question Answering, Knowledge representation, Semantic networks, Frames and scripts.
4. Expert System, Design of Rural-Based Expert System, Knowledge Engineering, Conceptual models and Knowledge acquisition.

Note: Implementation in LISP and/or PROLOG.

MCS-706: Lab on Design and Analysis of Computer Algorithms

Problems related to Design and Analysis of Computer Algorithms should be solved by using the Programming languages C/C++/JAVA (preferably on Unix/Linux/Solaris operating systems environment on a network). Following are some areas of Design and Analysis of Computer Algorithms for laboratory programming assignments but the assignments should not be limited to these only.

1. Stack and queues, tree, heap and heap sort, graphs and hashing.
2. Divide and conquer method: binary search, merge sort, quick sort, matrix multiplication, minimum spanning tree.
3. Dynamic programming: multistage graphs, all pair shortest paths, optimal binary search trees/I knapsack, travelling sales persons problem, flow shop scheduling.
4. Search and traversal techniques: AND/OR graphs, game trees, bi connected components and depth search.
5. Backtracking: Hamilton cycles, the fast Fourier transform, NP-HARD and NP complete problems.

MCS-801: Digital Image Processing

UNIT-I:
Digital image fundamentals - Concept of gray levels.Gray level to binary image conversion.Sampling and quantization.Relation ship between pixels.Imaging Geometry.
Image Transforms 2-D FFT , Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, Slant transform, Hotelling transform.

UNIT-II:
Image enhancement Point processing.Histogramprocessing.Spatialfiltering.Enhancement in frequency domain, Image smoothing, Image sharpening.

UNIT-III:
Colour image processing :Psedocolour image processing, full colour image processing.
Image compression Redundancies and their removal methods, Fidelity criteria, Image compression models, Source encoder and decoder, Error free compression, Lossy compression.

UNIT-IV:
Image Restoration Degradation model, Algebraic approach to restoration, Inverse filtering, Least mean square filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT-V:
Image segmentation Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region oriented segmentation.

Text Books/References:

1. Digital Image processing – R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, 2nd Education, 2002.
2. Fundamentals of Digital Image processing – A.K.Jain , PHI.
3. Digital Image processing using MAT LAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Edition, PEA, 2004.
4. Digital Image Processing – William K. Pratt, John Wilely, 3rd Edition, 2004.
5. Fundamentals of Electronic Image Processing – Weeks Jr., SPIC/IEEE Series, PHI.

MCS-802: Principles of Compiler Design

UNIT-I:
Overview of compiling process, some typical compiler structures, Regular expressions, The role of lexical analyzer, Input Buffering, Specification of tokens, recognition of tokens, Syntax trees, ambiguity , Context free Grammar and derivation of parse trees.

UNIT-II:
Top down and bottom up parsing, operator precedence parsing, syntax directed translation, translation schemes

UNIT-III:
Symbol Table: The contents of a symbol table, Data structures for symbol tables (ST), design of a ST, ST for block structured languages
Run time storage administration: Storage allocation strategies, static, dynamic and heap memory allocation, memory allocation in block structured languages, memory allocation in recursion, intermediate code.

UNIT-IV:
Code Generation:- Object Programs, Problems in code generation, a machine model, generating code from DAGs, A heuristic ordering for DAGs, Dynamic Programming code generation algorithm

UNIT-V:
Code Optimization: Principal sources of optimization, loop optimization, Global data flow analysis, code improving translation.

Text Books/References:

1. Compilers- Principles , Techniques and tools , Alfred V Aho, R.Sethi, D. Ullman (Pearson)
2. Compiler Design - K. Muneeswaran , Oxford university Press
3. The theory and practice of compiler writing , Trembley and Sorenson , (McGraw Hill)
4. Compiler Design, Santanu Chattopadyay , PHI

MCS-803: (a) Programming in C

UNIT-I:

Introduction to C: The C character set, identifiers and keywords, data types, constants, variables and arrays, C Instructions, expressions, statements, symbolic constants.Arithmetic operator: Unary operators, library functions, data input/output, preparing and running complete C program. Control statements: preliminaries, the WHILE, DO-WHILE, FOR, IF-ELSE, SWITCH, BREAK, CONTINUE, GOTO STATEMENTS, nested loops,

UNIT-II:

Functions and Pointers : Fundamental of pointer , pointer declarations, , defining a function, accessing a function, function declaration ,function prototypes ,passing arguments to a function, specifying arguments data types,passing pointers to a function, recursion.,

UNIT-III:

Arrays and Data Types: Defining an array, processing an array, passing arrays to a function, multi dimensional arrays, arrays and strings. Program structure, user define data types, storage classes, Automatic Storage Class, Register Storage Class, Static Storage Class ,External Storage Class .

UNIT-IV:

Structures and Unions: defining a structure, processing a structure, structures and pointers, passing structure to a function, self referential structure, and union.

UNIT-V:

Data files: Opening and closing a data file, creating a data file, processing a data file, programming with C unformatted data files.multi file programs. Enumeration, command line parameters, macros, the C preprocessor.

Text Books/References:

1. Programming with C - E. Balaguruswamy, McGraw Hill (Latest Edition)
2. Programming with C –Gottfried, Schaum's Outline Series (Latest Edition)
3. Let Us C Yashavant P. Kanetkar,BPB (Latest Edition)
4. Programming with C - Rajaraman R, PHI (Latest Edition)
5. Programming with ANSI C - B.T. Holmes, BPB (Latest Edition)
6. The C Programming Language - Kernighan & Ritchie, PHI (Latest Edition)

MCS-803: (b) Object Oriented Programming with C++

UNIT-I:
Introduction to object oriented Modeling, modeling techniques, Object oriented design, object Design, comparison of methodologies (SA/SD, OMT, JSD)

UNIT-II:
Principles of Object Programming, Beginning with C++, Tokens, Expressions and Control structures.

UNIT-III:
Function in C++, Classes and Objects, Constructors, Destructors.

UNIT-IV:
Operator Overloading and Type Conversions, Inheritance : Extending Classes.

UNIT-V:
Pointers, Virtual Functions and polymorphism, working with Files.

Text Books/References:

1. Object-Oriented Programming with C++, E. Balaguruswamy, TMH.
2. Tech yourself C++,Herbert schildt, Osborne Megraw Hill
3. Object-Oriented analysis and Design with applications, GrandyBooch
4. C & C++ Complete reference, Herbert Shieldth, Osborne McGraw Hill.
5. Object-Oriented programming in C++,NabajyotiBarkakati, PHI
6. C++ Primer Plus,StephenPrata, Galgotia Publications, 1996
7. C++ The Complete Reference - Herbert Shildt, Osborne McGraw Hill, 1991

MCS-803: (c) Programming in Java

UNIT-I:
Introduction To Java, Basic Features ,Java Virtual Machine Concepts, A Simple Java Program, Primitive Data Type And Variables, Java Keywords, Integer and Floating Point Data Type, Character and Boolean Types, Declaring and Initialization Variables, Type casting ,Java Operators, Expressions, control statements, Arrays.

UNIT-II:
Class Fundamentals, Creating objects ,Assigning object reference variables ,Introducing Methods, Method overloading, Static methods, Constructors, overloading constructors, This Keyword, Using Objects as Parameters, Argument passing, Returning objects ,Method Overriding, Garbage Collection, The Finalize ( ) Method, Inheritance Basics, Access Control ,Multilevel Inheritance, Abstract Classes ,Polymorphism ,Final Keyword, Package, Defining Package, CLASSPATH, Package naming, Accessibility of Packages, Using Package Members, Interfaces, Implementing Interfaces, Interface and Abstract Classes.

UNIT-III:
Exception Handling-try, catch, throw, throws ,Multithreaded Programming- Extands Thread class, Runnable interface , join and is alive method, I/O in Java ,Text Streams, Stream Tokenizer, Buffered Stream , Print Stream, Random Access File, The String Class ,String Buffer Class and Methods.

UNIT-IV:
Applets Programming, Building User Interface with AWT, Swing-based GUI, Layouts and Layout Manager, Container.

UNIT-V:
Event handling – Text filed, Button, Choice List, Radio button, Text area, Java Database Connectivity, Establishing A Connection, Transactions with Database.

Text Books:

1. Timoth Budd, An Introduction to Object Oriented Programming, Addition Wesly Publishing company(for Unit-I).
2. Herbert Schildt, The complete Reference, Tata McGraw Hill Publishing company
3. Patrick Naughton and Herbert Schildt, JAVA : the complete Reference, Tata McGraw-Hill Publishing company

Reference Books:

1. Samanta, Object Oriented Programming with C++ and Java, PHI
2. Core Java (Volume I &II), Sun Microsystem Press
3. Java How to Program,Prentice Hall, Deitel&Deitel

MCS-803: (d): Internet Technologies

UNIT-I:
Introduction, History of the Internet, Growth of the Internet, Past Decade Protocols, Internet applications, Security aspects, Computational features, Development of Internet in India. Cyber Crimes & Indian Cyber Laws, Internet Traffic Analysis using Wireshark.

UNIT-II:
Building a Corporate Web Sites, Practical Issues on Server and Application Software, Online Services Technology, E-commerce, Payment Gateway, Virtual Reality Applications on the Internet and Intranets, Messengers, Multimedia Communication using Xlite.

UNIT-III:
Internet Structure Protocols and Access Protocols, Router Technology, Gateway Technology, Web Servers-TOMCAT, XAM, FTP Design, Mail Server Design

UNIT-IV:
Hypertext Markup Language (HTML), DHTML, XML, Scripting Languages- Java Script & VB Script. JAVA Servlet Programming(JSP), Active Server Pages (ASP)

UNIT-V:
Web Development tools: Common Gateway Interface (CGI), PHP-My SQL Programs & Web Designs, Enterprise Web Development Tools, Web Database Design & Connection.

Text Books:
1. Daniel Minoli, "Internet and Internet Engineering", TMH
2. Joel Sklar, "Principles of Web Design", Vikas& Thomson Learning
3. Sharma & Sharma, "Developing E-Commerce Sites", Addison Wesley

Reference Books:
1. Keith and Jill, "Active Server Pages", Vikas Publishing
2. Gosslin, "Java Script", Vikas Publishing
3. Horstmann, "Core Java 2, vol I & II", Addison Wesley

MCS-804 :(a)Artificial Neural Networks

UNIT-I:
Introduction to Neural Networks: Biological and Artificial Neurons, Perceptrons, Classification and Linear Separability X-OR problem, Hopfield Networks, Overview of Neural Networks Architectures-Multiayered feed forward and Recurrent Networks, Learning-Supervised, Unsupervised and Reinforcement Generalised Delta Rule.

UNIT-II:
Multilayered Networks: Backpropagation (BP) Networks, BP Training Algorithm and Derivation for Adaption of weight, variations in Back propagation and Alternative cost function, Radial Basis function (RBF) Networks, Applications of BP and RBF Networks.

UNIT-III:
Recurrent Networks and Unsupervised Learning : Counter Back propagation Networks, Boltzman Machine, Unsupervised learning methods, Hebbian learning Kohonen's Self Organizing feature maps, Adaptive Resonance Theory.

UNIT-IV:
Associative Memories: Matrix, Auto, Hetero and Bidirectional Associative memories, Applications of Associative Memories. Neuro Fuzzy System: Relevance of Integration between Fuzzy Sets and Neural Networks-pros and cons, Fuzzy Neurons, Fuzzy Neuro Controllers.

UNIT-V:
Neuro Computation : Domains of Application of Neural Networks – Expert System & Decision Making system, Pattern Recognition, Neuro Controllers and Fuzzy Neuro Controllers.

Text Books/References:

1. B. Yagnanarayana, "Artificial Neural Networks", PHI.
2. S. Haykim, Neural Network (a Comprehensive Introduction), PHI, 1999 (2^{nd}Edn)
3. Limin Fu, "Neural Networks in Computer Intelligence", McGraw Hill International, 1994
4. John Hertz, Anders Krogh and Richard G. Palmer, "Introduction to the Theory of Neural Computations", Addison Wesley 1991
5. Yoh-Han Pao, Adaptive Pattern Recognition and Neural Networks", Addison Wesley 1989.
6. Fundamentals of Artificial Neural Networks, Mohammad Hassoun, PHI, New Delhi, 1998.

MCS-804(b): Mobile Ad Hoc Networks

UNIT-I:
INTRODUCTION: Introduction to Adhoc Networks – Definition, Characteristics, Applications, Wireless channel, Adhoc Mobility Models:- Indoor and outdoor models.

UNIT-II:
MEDIUM ACCESS PROTOCOLS: MAC Protocols, Design Issues, Goals and classification, Contention based protocols- with reservation, Scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15.

UNIT-III:
NETWORK PROTOCOLS: Routing Protocols, Design issues, Goals and Classification. Proactive Vs Reactive routing, Unicast Routing Algorithms, Multicast Routing Algorithms, Hybrid Routing Algorithm, Energy Efficient Routing Algorithm, Hierarchical Routing, QoS aware Routing.

UNIT-IV:
END-END DELIVERY AND SECURITY: Transport layer, Issues in Designing, Transport layer classification, Adhoc Transport Protocols, Security issues in Adhoc Networks: issues and challenges, Network security attacks, Secure routing protocols. Implementation of Adhoc networks, Performance Analysis

UNIT-V:
CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G: Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary perspective. Integration of adhoc with Mobile IP networks, WAP.

TEXT BOOKS:
1. C.K.Toh, Ad Hoc Mobile Wireless Networks: Protocols and Systems, Pearson, 2001
2. C.Siva Ram Murthy and B.S.Manoj, Ad hoc Wireless Networks Architectures and protocols, 2nd edition, Pearson Education. 2007
3. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000

REFERENCES:
1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan Stojmenovic, Mobile Adhoc networking, Wiley-IEEE press, 2004.
2. Mohammad Ilyas, The Handbook of Adhoc Wireless Networks, CRC press, 2002.

MCS-804(c): Natural Language Processing

UNIT-I:
Man-Machine Interface: Concept of Artificial Intelligence (AI), information system and information processing, concept of formal language,Finite State Automata, Non deterministic Finite State Automata(NFSA),Using an NFSA to accept strings, Relating deterministic and non deterministic FSA, Natural Language (NL) and real language, natural language as man-machine interface.

UNIT-II:
Natural Language Processing: Basic characteristic of NL, knowledge representation, level of representation in NL, function of natural language. Morphology & Finite State Transducers: Survey of (mostly) English morphology,Inflectional morphology, derivational morphology.

UNIT-III:
Introduction to shallow parsing and morphological analyzer:Rule based POS tagger, Stochastic POS tagger,Chunking, Use of Morphological analyzer in POS tagging. Introduction to HMM Tagger:HMM for POS tagging,Viterbi algorithm, Parsing: Top Down Parsing, Bottom up Parsing, EarleyParsing, and Finite-State Parsing Methods.

UNIT-IV:
Computational Linguistics: Relationship between linguistics and NLP, computational models for phonology, lexicography, syntax, semantics and discourse.

UNIT-V:
Processes and Methods: Pursuing applications – machine translation, information retrieval, information extraction, natural language in multimodal and multimedia systems, computer assisted language learning, multilingual on-line natural language processing.

Text Books/References:

1. A.M. Andrew, Artificial Intelligence. Kent: Abacus Press, 1983.
2. R., Grishman, Computational Linguistics, Cambridge: Cambridge University Press, 1986.
3. Natural Language Understanding: James Allan,Pearson Education
4. Speech and Language Processing: Jurafsky and Martin,Pearson Education
5. Natural Language Processing: Bharati et al., PHI

MCS-805: Lab on Digital Image Processing

Following are some areas of Digital Image Processing programming assignments but the assignments should not be limited to these only.

1. Write MATLAB program to
   (a) Read and display image
   (b) Resize given image
   (c) Convert given color image into gray-scale image
   (d) Convert given color/gray-scale image into black & white image
   (e) Draw image profile
   (f) Separate color image in three R G & B planes
   (g) Create color image using R, G and B three separate planes
   (h) Write given 2-D data in image file
2. To write and execute image processing programs using point processing method
   (a) Obtain Negative image (b)Obtain Flip image (c) Thresholding (d) Contrast stretching
3. To write and execute programs for image arithmetic operations
   (a) Addition of two images
   (b) Subtract one image from other image
   (c) Calculate mean value of image
   (d) Different Brightness by changing mean value
4. To write and execute programs for image logical operations between two images
   (a) AND (b) OR (c) EX-OR (d)NOT operation (Negative image)
5. To write a program for histogram calculation and equalization using standard MATLAB function
6. To write and execute program for geometric transformation of image
   (a) Translation (b)Scaling (c)Rotation (d)Shrinking (e)Zooming
7. To understand various image noise models and to write programs for image restoration
   (a) Remove Salt and Pepper Noise
   (b) Minimize Gaussian noise
   (c) Median filter and Weiner filter
8. Write and execute programs to remove noise using spatial filters
   (a) Understand 1-D and 2-D convolution process
   (b) Use 3x3 Mask for low pass filter and high pass filter
9. Write and execute programs for image frequency domain filtering
   (a) Apply FFT on given image
   (b) Perform low pass and high pass filtering in frequency domain
   (c) Apply IFFT to reconstruct image
10. Write a program in MATLAB for edge detection using different edge detection mask.
11. Write a program in MATLAB for edge detection using convolution in spatial domain.
12. Write and execute program for image morphological operations erosion and dilation.
13. To write and execute program for wavelet transform on given image and perform inverse wavelet transform to reconstruct image.

MCS-806: Lab on Principles of Compiler Design

Problems related to Compiler Design should be solved by using the Programming languages C/C++/JAVA as well as various tools for Compiler Construction and Design like LEX, YACC, BYSON etc. Following are some areas of Compiler Design for laboratory programming assignments but the assignments should not be limited to these only.

1. Construction of a lexical analyzer and LL(1) parser for a subset of FORTRAN/PASCAL/C/C++ (to be done without using any generator).
2. Construction of a lexical analyzer and LALR(1)/LR(1) parser for a subset of C/C++ (generators like LEX, YACC, BYSON to be used).
3. A construction of a translator from a high level to an intermediate language which is also a very simple subset of C (The correctness of this translation may be checked by compiling this intermediate program by a standard compiler).
4. Construction of a target code generator from the above intermediate language program to the assembly language of a suitable target machine (e. g. Intel 8088). Addition of rudimentary code optimization (like peep-hole)/jump optimization.
5. Register optimization to the generated compiler.
6. Experiments with incorporation of debugging features.

MCS-901: Software Engineering

UNIT-I:

Software: Importance of software, Characteristics, Components, Applications of Software, Software Myths.Planning and Management of software Project : People, problem and process, measures, matrices and indicators, matrices for software quality, scooping, software project estimation, make-buy decision, software acquisition.Life Cycle Models: linear sequential (Waterfall) model, Iterative models, RAD Model, Prototyping Model, Spiral Model.

UNIT-II:

Project scheduling and tracking: tasks/work breakdown structures, Activity Network and CPM, Gantt and PERT Charts, timeline chart, CASE tools.Requirements Elicitation: Interviews, Brainstorming, FASTRequirement Analysis : Data flow diagrams, behavioral models, mechanics of structured analysis, ER diagrams, data dictionary, Software Prototyping.Requirement Documentation: Nature, characteristics and organization of SRS and SRS reviews.Software Project Planning : LOC, Function count, Empherical and Heuristic Estimation Techniques: COCOMO, Intermediate COCOMO, Complete COCOMO and COCOMO-II models. Software risk management : Risk Identification, Risk assessment, Risk monitoring Risk Containment.

UNIT-III:

Software Design: Conceptual and Technical Designs, Objectives of Design.Modularity : Module Coupling, Module Cohesion, Relation between cohesion and coupling.Design Strategy: Bottom- up, Top-Down, Hybrid Design.Function oriented design : design notations, Functional Procedural layers, DFD, Flowchart, Structure charts, Transform and transaction analysis.Object Oriented Design : Basic mechanism, concepts, advantages of OOD , unified modeling language (UML).

UNIT-IV:

Software testing and testing strategies : Software testing fundamentals, test case design, white-box, black-box testing, control structure testing, strategic approach to testing, strategic issues, UNIT- testing, integrated testing, validation testing, system testing.

UNIT-V:

Software quality concepts, Software quality assurance (SQA) and approaches, SQA plan.Software Reliability: ISO 9000 and SEI standards for software.

software configuration management (SCM): base lines, scan process, version control, change control, SCM audits.

Text Books/References:

1. Roger Pressman: Software Engineering, A Practitioner's Approach, 4th Ed., Tata Mgraw Hill pub.
2. RajibMall : Fundamentals of Software Engineering. (PHI)
3. Pankaj Jalote: An Integrated Approach of Software Engineering (Galgotia)
4. K.K.Agarwal, Yogeshsingh : Software engineering (New Age International publishers).

MCS-902: Term Paper and Grand Viva

MCS-903: Data Mining and Knowledge Discovery

UNIT-I:
Introduction to Data Mining and data Warehousing, What is Data ware house, Definition, Need for data Ware house, DBMS vs Data Ware house, Multi dimensional data Model, Data Cubes, Ware house Schema, stars, snowflakes, and fact constellations, data ware housing architecture and process, Ware house server, Metadata, Data ware house back end process, Data ware house physical design – partitioning, indexing, integrity constraints, materialized views, Data ware house construction – data extraction, transformation, loading and refreshing.

UNIT-II:
OLAP technique for data ware house, OLAP architecture, operations and OLAP engine, SQL extensions for OLAP, types of OLAP servers, 3-tier data ware house architecture, Data ware house implementation and data warehousing back end tools.
Fundamentals of Data Mining, Definitions, KDD vs Data Mining, Data Mining Functionalities, Data Mining techniques, DBMS vs Data Mining, data mining techniques, Classification of data Mining problems, Major issues and challenges of data mining, Data Mining tools and Applications.

UNIT-III:
Association rule mining in large data bases, Definition and types of Association rules, Association Rule Mining Algorithms: *A priori, Partition, FP Tree Growth Algorithms*. Discussion on Different Algorithms, *Incremental Algorithm, Border Algorithm*, generalized Algorithm, generalized Association Rule Mining, and Association Rules with item set constraints. Recent trends in Association rule mining.

UNIT-IV:
Clustering techniques: Introduction, clustering paradigms, Categorization of major clustering methods, partitioning algorithms, *k-Means algorithm, k-medoid algorithms: PAM, CLARA, CLARANS, Hierarchical Clustering algorithms: DBSCAN and BIRCH, Categorical Clustering Algorithms: STIRR and ROCK,* Recent trends in Clustering.

UNIT-V:
Classification and prediction: Issues regarding classification and prediction, Classification by Decision tree Induction, Bayesian Classification, Classification by back propagation, Other Classification methods, Prediction, Classifier accuracy.
Overview of Advanced data mining techniques: WEB Mining, Spatial Mining, Spatial and Temporal data mining.

Text Books:
1. Data Mining Techniques: Arun Kumar Pujari, Universites Press, Third Edition, 2013
2. Data Mining: Concepts and Techniques: Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, Third edition, 2011

Reference Book:

1.Data Mining: Introductory and Advanced Topics: Margaret H Dunham, Pearson Education, 2008.
2. Introduction to Data Mining: Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Pearson Education, 2009.

MCS-904: Elective - I (a) Advanced Operating System

UNIT- I:
Process Synchronization: Concepts of processes, Concurrent processes, Threads, Overview of different classical synchronization problems, Monitors, Communicating Sequential processes (CSP)
Process deadlocks: Introduction, causes of deadlocks, Deadlock handling strategies, Models of deadlock.

UNIT-II:
Distributed operating system: Architectures, Issues in Distributed operating systems, Limitations of Distributed Systems, Lamport's logical clock, Global states, Chandy-Lampert's global state recording algorithm,Basic concepts of Distributed Mutual Exclusion ,Lamport's Algorithm, Ricart–AgrawalaAlgorithm;Basic concepts of Distributed deadlock detection, Distributed File system, Architecture, Design issues, SUN Network File system
Basic concepts of Distributed shared memory, Basic concepts of Distributed Scheduling, Load balancing, Load sharing.

UNIT-III:
Distributed OS Implementation: Models, Naming, Process migration, Remote Procedure Calls.
Multiprocessor System: Motivation, Classification, Multiprocessor Interconnections, Types, Multiprocessor OS functions & requirements; Design & Implementation Issue; Introduction to parallel programming; Multiprocessor Synchronization.

UNIT-IV:
Performance, Coprocessors, RISC & data flow: Introduction, Necessity, Measures, Techniques, Bottlenecks & Saturation, Feedback loops, Coprocessors, RISC.
Analytic Modeling: Introductions, Queuing Theory, Markov Process.

UNIT-V:
Security & Protection: Security-threats & goals, Penetration attempts, Security Policies & mechanisms, Authentication, Protections & access control Formal models of protection, Cryptography, worms & viruses.
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Textbooks:
1. Milan Milenkovic, Operating Systems: *Concepts & design*, TMH
2. H.M. Deitel, Operating System, Pearsons .
3. MukeshSinghal and Niranjan G. Shivaratri, Advanced Concepts in operating Systems, TMH

MCS-904: Elective- I (b) Computer Vision

UNIT-I:
Introduction: What is computer vision? The Marr paradigm and scene reconstruction. Other paradigms for image analysis. Image Formation. Image Geometry. Radiometry. Digitization

UNIT-II:
Binary Image Analysis and Segmentation: Properties. Digital geometry. Segmentation.

UNIT-III:
Image Processing for Feature: Detection and Image Synthesis. Edge detection, corner detection, Line and curve detection, SIFT operator, Image-based modeling and rendering, Mosaics, snakes

UNIT-IV:
Stereo. Shape from X. Shape from shading. Photometric stereo. Texture. Occluding contour detection. Motion Analysis: Motion detection and optical flow. Structure from motion.

UNIT-V:
Object Recognition: Model-based methods, Appearance-based methods, Invariants.

Textbooks:

1. D. A. Forsyth and J. Ponce, Computer Vision: A Modern Approach, Prentice Hall, 2003.

References:

1. Shapiro, L. & Stockman, Computer Vision, G. Prentice Hall.
2. Trucco&verri, Introductory technique for 3D computer vision, Prentice-Hall

MCS-904: Elective-I (c) Advance Java Programming

UNIT-I:

Client & server side programming. Enterprise architecture styles: Single tier , 2-tier , 3-tier, n-tier; Relative comparison of the different layers of architectures. MVC Architecture: Explanation, Need, Drawbacks, J2EE WEB SERVICES, Different components & containers. Servlet: Introduction, Advantages over CGI, How it works?, Servlet life cycle, Servlet API (Different interfaces & classes of generic servlet & HTTP servlet), Accessing user information by means of Request & Response, Servlet session management techniques and relative comparison.

UNIT-II:

JSP: Introduction, Comparison between JSP &servlet., Architecture/Life cycle, Different types of JSP architectures and relative comparison.; JSP tags ,Directives, Scripting elements, Actions; JSP implicit objects, Accessing user information using implicit objects. EJB :Introduction, Comparison of EJB & Java Beans , Applications, Drawbacks, Different types of enterprise beans ,Services provided by EJB container.

UNIT-III:

RMI: Introduction and applications, Architecture ,Use of RMI Registry.
JNDI: Introduction and applications, Comparison between LDAP and JNDI
JDO (Java Data Objects): Introduction, Integration of EJB and JDO, JDO & RMI
JINI: Introduction, Applications.

UNIT-IV:

JDBC: Introduction, Database driver ,Different approaches to connect an application to a database server, Establishing a database connection and executing SQL statements, JDBC prepared statements, JDBC data sources.

UNIT-V:

XML: Java & XML, XML syntax, Document type definition., Parsers, SAX parsers, DOM parsers, SAX vs. Dom, JAXP and JAXB.

Textbooks:

1. Allamaraju and Buest, Professional JAVA Server Programming, SPD Publication
2. Ivor Horton, Beginning J2EE 1.4, SPD Publication.
3. Austin and Pawlan, Advanced Programming for JAVA 2 Platform, Pearson

References:

1. Krishnamoorthy& S. Prabhu, Internet & Java Programming, New Age Publication

MCS-904: Elective - I (d) Distributed Data Base Systems

UNIT-I:
Distributed DBMS features and needs. Reference architecture. Levels of distribution transparency, replication. Distributed database design - fragmentation, allocation criteria.

UNIT-II:
Storage mechanisms. Translation of global queries. / Global query optimisation. Query execution and access plan. Concurrency control - 2 phases locks. Distributed deadlocks. Time based and quorum based protocols. Comparison. Reliability- non-blocking commitment protocols.

UNIT-III:
Partitioned networks. Checkpoints and cold starts. Management of distributed transactions- 2 phase UNIT-protocols. Architectural aspects. Node and link failure recoveries.

UNIT-IV:
Distributed data dictionary management. Distributed database administration. Heterogeneous databases-federated database, reference architecture, loosely and tightly coupled.

UNIT- V:
Alternative architecture. Development tasks, Operation- global task management. Client server databases-SQL server, open database connectivity.Constructing an application.

Textbooks:

1. SilberschatzKorth, Sudarshan, Database System Concepts, MH
2. Ceri &Pelagatti, Distributed Databases: *Principles and Concepts,* TMH
3. Ozsu& Sridhar, Principles of Distributed Database Systems, Pearson
4. Fundamentals of Database System: R. Elmasri& S. Navathe (Benjamin Cummings)

References:

1. Ramakrishnan, Database Management Systems, RMH
2. Vieira, Beginning SQL Server 2005 programming, SPD/WROX
3. Leon, Database Management Systems, VIKAS

MCS-904: Elective -I (e) Evolutionary Computation

UNIT-I:

Genetic algorithms - the three main genetic operators, Schema theory, Schema theorem.

UNIT-II:

The building block hypothesis, implicit parallelism.Exploration versus exploitation.
Stochastic models of GAs- reliability model, branching-process model, Markov models.

UNIT-III:

Convergence analysis, Analysis of **Selection**, Analysis of **crossove**r, Analysis of mutation-crossover versus mutation.

UNIT-IV:

Non-canonical GAs.Deception.Evolutionstrategies.Evolutionaryprogramming.Genetic programming.

UNIT-V:

Applications of **EAs** in diverse field - constrained optimization, combinatorial optimization, learning.
Hybrid strategies and connections to other soft computing paradigms.

Text Books:

1. David E. Goldberg: Genetic Algorithms in Search, Optimization and Machine Learning, Addision Wesley, MA, 1989.

References:

1. IEEE Transactions on Evolutionary Computation.
2. Evolutionary Computation, MIT Press.

MCS-904: Elective – I(f) Machine Learning

UNIT-I:
Introduction-Objectives-Taxonomy. Review Basic Tasks, Methods and underlying problems of Machine Learning.

UNIT-II:
Learning methods such as role, analogical, EBG, EBL, Chunking.Learning form Examples - Version space algorithm, Inductive Concept Learning - Sequence Prediction - Effect of Noise in Input.

UNIT-III:
Learning by Analogy- Concept formation - Derivational Analogy, Learning by Observation and Discovery Search for Regularity-Conceptual Clustering

UNIT-IV:
ID3 algorithm, Important systems and applications to the problem of knowledge acquisition for expert system.

UNIT-V:
Computational Learning Theory, Connectionist Learning.

Text Books/References:

1. Michalsky, T. Mitchell, J.Corbonell, Machine Learning Springer-Verlag.
2. T. M. Mitchell. Machine Learning, McGraw-Hill, 1997.
3. Michalski, Carbonnel& Michel (Eds.): Machine Learning - An A. I. Approach, Vols. I, II & III, Morgan Kaufmann.
4. C. J. Thornton: Techniques in Computational Learning, Chapman & Hall Computing.

MCS-905: Data Mining and Knowledge Discovery

Problems and various algorithms related to Data Ware Housing and Data Mining should be solved and implemented by using the Programming languages C/C++/JAVA/VB/SQL/ORACLE as well as various tools for Data Ware Housing and Data Mining. Following are some areas of Data Ware Housing and Data Mining for laboratory programming assignments but the assignments should not be limited to these only.

(i) Data ware house design and implementation, Data Cube Design and Implementation, Implementation of the OLAP Operations.

(ii) Implementation of Apriori, Partition and FP Growth Algorithm

(iii) Implementation of k-Means, k-medoid algorithms and any one of each of the hierarchical and categorical clustering algorithms

(iv) Implementation of one classification algorithm and the Page Rank algorithm.

MCS-906: Lab on Elective –I

MCS-1001: Distributed Computing

UNIT-I:
Fundamentals: Introduction, Models and Features, Concept of distributed operating system, Issues in design of a distributed operating system, Client Server Computing.
Message Passing: Good message passing system, IPC, Synchronization, Buffering, Multi datagram messages, Encoding & decoding techniques, Process addressing, Failure handling, Group communication; Remote procedure calls (RPC) - Models, Communication protocols, RPC, Lightweight RPC.

UNIT-II:
Distributed Shared Memory: Architecture, Thrashing, Granularity, Advantages.Synchronization: Introduction, Clock Synchronization, Event handling, Mutual Exclusion; Deadlock – Conditions, Avoidance, Prevention, Recovery.

UNIT-III:
Resource & process Management: Features of a good scheduling algorithm, Task assignment approach, Load balancing & load sharing approach, Introduction to process management, Process migration, Threads.

UNIT-IV:
Distributed Files Systems: Introduction, Features, Models, Accessing models; sharing Semantics & caching schemes, replication, Fault Tolerance, Atomic transactions.Distributed File Servers, Distributed Real Time System

UNIT-V:
Distributed Database, Concurrency Control in Distributed Database, Naming: Introduction, Features, Fundamental Terminologies & concepts, System oriented names, Human oriented names, Name caches.
Security: Potential attacks to computer system, Cryptography, Authentication, digital signatures, Access Control.

Textbooks:
1. Sinha Pradeep K., Distributed operating Systems, Concepts & design, PHI.
2. Tanenbaum Andrews S., Distributed Operating System, Pearson Education.

Reference Books:
1. Coulouris George, Dollimore Jean, Kindberg Tim, Distributed Systems, Concepts & design, Pearson.
2. Silberschatz& Galvin, Operating System Concepts, John Wiley, 5th Edition.

MCS-1002: Fuzzy Set Theory and Applications

Unit I

Introduction to Fuzzy Sets: Basic Concepts: Fuzzy Sets versus Crisp Sets: Properties of Alpha-Cuts, Representation of Fuzzy Sets, Extension Principle for Fuzzy Sets

Unit I

Operation on Fuzzy Sets: Types of Operations, Fuzzy Complements, Fuzzy Intersection: *t*-Norms, Fuzzy Unions: *t*-Conorms, Combinations of Operations

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals, Arithmetic Operations on Fuzzy Numbers

Unit III

Fuzzy Relations: Crisp Verses Fuzzy Relations, Binary Fuzzy Relations, Binary Relation on a Single Set, Fuzzy Equivalence Relations, Fuzzy Compatibility Relations, Fuzzy Ordering Relations, Fuzzy Morphisms

Unit IV

Possibility Theory: Fuzzy Measures, Evidence Theory, Possibility Theory, Fuzzy Sets and Possibility Theory, Possibility Theory versus Probability Theory

Fuzzy Logic: Multivalued Logics, Fuzzy Propositions, Fuzzy Quantifiers, Linguistics Hedges

Unit V

Some Applications of Fuzzy Sets –

Approximate Reasoning (Overview): Fuzzy Expert System, Fuzzy Implications

Fuzzy Systems (Overview): Fuzzy Controllers, Fuzzy System & Neural Network, Fuzzy Automata

Pattern Recognition (Overview): Fuzzy Clustering, Fuzzy Pattern Recognition, Fuzzy Image Processing

Text Books/References:

1. Fuzzy Sets and Fuzzy Logic Theory and Applications – George J. Klir and Bo Yuan, PHI Pvt. Ltd.
2. Fuzzy Set Theory and Its Applications – Zimmermann, Hans-Jürgen, Springer Netherlands
3. Neutral Networks in Computer Intelligence – LiMin Fu, McGraw Hill Edition
4. Neuro-Fuzzy and Soft Computing, A Computational Approach to Learning and Machine Intelligence – J.-S R Jang, C.-T Sun, E. Mizutani, Pearson
5. Fuzzy Logic with Engineering Applications, T. J. Ross, Wiley

MCS-1003: Elective - II (a) Computational Geometry

UNIT-I:
Introduction: historical perspective, algorithmic background, geometric preliminaries, initial forays
Convex hulls, problem statement and lower bounds, convex hull algorithms, convex hulls in >2 dimensions, extensions and applications

UNIT-II:
Polygon approximation: triangular approximations, k-gonal approximations, restricted approximations, other criteria of approximation

UNIT-III:
Geometric searching: point-location problems, range-searching problems.

UNIT-IV:
Proximity : Typical problems and lower bounds, Closest pair problem, Voronoi diagrams, Minimum spanning trees, Triangulations.

UNIT-V:
Miscellaneous problems: (More) Art gallery problems, Intersections, Pattern recognition, Parallel computational geometry

Text Books/References:

1. Laszlo, Computational Geometry, PHI
2. M.de Berg, Computational Geometry-algorithms &applications, Springer India

MCS-1003: Elective - II (b) Clustering and Grid Computing

UNIT-I:
Introduction: Motivation, Definitions of Grid Computing, Evolution of the Grid, Differences with similar efforts (Meta, cluster, heterogeneous, Internet), Examples of usage, scope of Grid Computing.

UNIT-II:
The Earliest Grid Motivations: High Performance computing across installation sites - the PACX-MPI example, High Throughput computing using non-dedicated workstations – Condor.

UNIT-III:
The Building Blocks of Grid: The Globus toolkit, Security - Kherberos vs Globus GSI, Information Services – NWS, Projects over Globus - e.g. Condor-G.

UNIT-IV:
HPC and Grids: Scheduling HPC applications in Grids- AppLeS, Scheduling Parameter sweep applications, Metascheduling; Grid RPC mechanisms; Rescheduling.

UNIT-V:
Advanced Topics: Data Management in Grids, Grid simulation – MicroGrid, Grid Applications, Grid economy, Grid standards and forums - OGSA, GGF and Other topics.

Textbooks:

1. The Grid: Blueprint for a New Computing Infrastructure (2nd edition) by Ian Foster (Editor), Carl Kesselman (Editor) Publisher: Morgan Kaufmann; 2nd edition (November 2003) ISBN: 1-558-60933-4.
2. Grid Computing: Making the Global Infrastructure a Reality by Francine Berman (Editor), Geoffrey Fox (Editor), Tony Hey (Editor) Publisher: John Wiley & Sons; (April 8, 2003) ISBN: 0-470-85319-0.

References Books:

1. Grid Resource Management: State of the Art and Future Trends by JarekNabrzyski (Editor), Jennifer M. Schopf (Editor), Jon Weglarz (Editor) Publisher: Kluwer Academic Publishers; (September 2003) ISBN: 1-402-07575-8.
2. The Grid 2: Blueprint for a New Computing Infrastructure by Ian Foster and Carl Kesselman, Morgan Kaufmann Nov 2003, ISBN: 1558609334.

MCS-1003: Elective - II (c) Pattern Recognition

UNIT-I:

Introduction: Examples; The nature of statistical pattern recognition; Three learning paradigms; The sub-problems of pattern recognition; The basic structure of a pattern recognition system; Comparing classifiers.
Bayes Decision Theory: General framework; Optimal decisions; Classification; Simple performance bounds.

UNIT-II:

Learning - Parametric Approaches: Basic statistical issues; Sources of classification error; Bias and variance; Three approaches to classification: density estimation, regression and discriminant analysis; Empirical error criteria; Optimization methods; Failure of MLE;

Parametric Discriminant Functions : Linear and quadratic discriminants; Shrinkage; Logistic classification; Generalized linear classifiers; Perceptrons; Maximum Margin; Error Correcting Codes;

UNIT-III:

Error Assessment: Sample error and true error; Error rate estimation; Confidence intervals; Resampling methods; Regularization; Model selection; Minimum description length; Comparing classifiers
Nonparametric Classification: Histograms rules; Nearestneighbor methods; Kernel approaches; Local polynomial fitting; Flexible metrics; Automatic kernels methods

UNIT-IV:

Feature Extraction: Optimal features; Optimal linear transformations; Linear and nonlinear principal components; Feature subset selection; Feature Extraction and classification stages, Unsupervised learning and clustering, Syntactic pattern recognition, Fuzzy set Theoretic approach to PR,

UNIT-V:

Margins and Kernel Based Algorithms: Advanced algorithms based on the notions of margins and kernels Applications of PR: Speech and speaker recognition, Character recognition, Scene analysis.

Textbooks:

1. Theodoridis&Koutroumbas, Pattern Recognition, Academic Press

MCS-1003: Elective - II (d) Quantum Computation

UNIT-I:
Introduction to Quantum Computation, Concept and Fundamental Properties of Cbits and Qbits- Cbits and their states, Reversible Operations on Cbits, Qbits and their states. Reversible Operations on Qbits. The measurement of Qbits, Table: Cbits vs. Qbits Further Features of Dirac Notation. Structure of the general 1-Qbit UNIT-ary transformation Structure of the general 1-Qbit state. An application of the formalism: \Spooky action at a distance", A General Remark about the Figures

UNIT-II:
Quantum Computation: General features and some simple examples, The general computational process, Deutsch's Problem; Why additional subroutine Qbits needn't mess things up; Some more substantial speed-ups with a quantum computer: Bernstein-Vazirani problem; Simon's problem.The importance of cNOT gates.

UNIT-III:
Breaking RSA Encryption with a Quantum Computer: Shor's Factoring Algorithm, Number theoretic preliminaries, RSA encryption, Quantum period-finding: setting things up, The Quantum Fourier Transform, Calculating the periodic function, The unimportance of unavoidable small phase errors, Period finding and factoring

UNIT-IV:
Searching with a Quantum Computer The Grover iteration, How to construct W, Generalization to several special numbers. Quantum Error Correction.A simplified example of quantum error correction.The physics of error generation, Diagnosing error syndromes.Error correcting codes, The 7-Qbit code, Circuits that make the 7- and 5-Qbit codewords.

UNIT-V:
Quantum cryptography and some simple uses of entanglement, Quantum cryptography, Bit commitment, Quantum dense coding, Teleportation, The GHZ state.

MCS-1003: Elective - II (e) Embedded Real Time Systems

UNIT-I:

Introduction: Embedded systems overview, design challenge, processor technology, IC technology, Design Technology, Trade-offs. Single purpose processors RT-level combinational logic, sequential logic (RT-level), custom single purpose processor design (RT-level), optimizing custom single purpose processors.

General Purpose Processors : Basic architecture, operation, Pipelining, Programmer's view, development environment, Application Specific Instruction-Set Processors (ASIPs) – Micro Controllers and Digital Signal Processors.

UNIT-II:

State Machine And Concurrent Process Models : Introduction, models Vs. languages, finite state machines with data path model (FSMD), using state machines, program state machine model (PSM), concurrent process model, concurrent processes, communication among processes, synchronization among processes, implementation, data flow model, real-time systems.

UNIT-III:

Communication Interface : Need for communication interfaces, RS232 / UART, RS422 / RS485, USB, Infrared, IEEE 1394 Firewire, Ethernet, IEEE 802.11, Blue tooth.

UNIT-IV:

Embedded / RTOS Concepts – I : Architecture of the Kernel, Tasks and Task scheduler, Interrupt service routines, Semaphores, Mutex. Mailboxes , Message Queues, Event Registers, Pipes, Signals
Timers, Memory Management, Priority inversion problem, Embedded operating systems Embedded Linux, Real-time operating systems, RT Linux, Handheld operating systems, Windows CE.

UNIT-V:

Design Technology : Introduction, Automation, Synthesis, Parallel evolution of compilation and synthesis, Logic Synthesis, RT synthesis, Behavioral Synthesis, Systems Synthesis and Hardware/ Software Co-Design, Verification, Hardware/Software co-simulation, Reuse of intellectual property codes.

TEXT BOOKS:

1. Embedded System Design – A Unified Hardware/Software Introduction - Frank Vahid, Tony D. Givargis, John Wiley, 2002.
2. Embedded / Real Time Systems – KVKK Prasad, Dreamtech Press, 2005.

REFERENCES:

1. Embedded Microcomputer Systems – Jonathan W. Valvano, Brooks / Cole, Thompson Learning.
2. An Embedded Software Primer – David E. Simon, Pearson Ed., 2005.
3. Introduction to Embedded Systems – Raj Kamal, TMS, 2002.
4. Embedded Real Time Systems Programming – Sri Ram V Iyer, Pankaj Gupta, TMH, 2004.

MCS-1003: Elective - II (f) Digital Signal Processing

UNIT-I:
Introduction, Overview of digital signal processing ,Review of :Discrete – Time linear system, Sequences, arbitrary sequences, linear time invariant system, causality, stability. Difference equation, relation between continuous and discrete system.Classifications of sequence, recursive and non-recursive system.
Review of :Mathematical operations on sequences: Convolution, graphical and analytical techniques, overlap and add methods, matrix method, some examples and solutions of LTI systems, MATLAB examples.

UNIT-II:
Z-transform: Definition, relation between Z transform and Fourier transform of a sequence, properties of Z transform, mapping between S-plane and Z-plane. UNIT- circle, convergence and ROC, Inverse Z-transform, solution of difference equation using the one sided Z-transform MATLAB examples.

UNIT-III:
Discrete Fourier transform: Definition, inverse discrete Fourier transform (IDFT) Twiddle factor, linear transformation, basic properties, circular convolution, multiplication of DFT, linear filtering using DFT, filtering of long data sequences, overlap add and save method. Computation of DFT, Fast Fourier transform (FFT), FFT algorithm, Radix 2 algorithm. Decimation-in-time and decimation-in- frequency algorithm, signal flow graph, butterflies, Chirp z-transform algorithm, MATLAB examples.

UNIT-IV & V:
Digital filter realization: Principle of digital filter realization, structures of All-zero filters. Design of FIR (Finite impulse response) filters, linear phase, windows-rectangular, Berlitt, Hanning, Hamming and Blackman.Design of infinite impulse response filters (IIR) from analogfilters.Bilinear transformation, Butterworth, Chebyshev, Elliptic filters. Optimisation method of IIR filters. Some example of practical filter design. Computer aided filter design, MATLAB examples .

Textbooks:
1. Ifeachor, Digital Signal Processing, Pearson
2. R. G. Lyons, Understanding Digital Signal Processing, Pearson
3. L.R. Rabiner&B.Gold, Theory and Application of Digital Signal Processing, PHI
4. J.G. Proakis& D.G. Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, PHI
5. S. Salivahanan et al, Digital Signal Processing, TMH

References books:
1. Chen, Digital Signal Processing, OUP
2. Meyer-Basse U, Digital Signal Processing with FPGA, Spriger India
3. Ingle, Digital Signal Processing using MATLAB, Vikas
4. Babu R, Digital Signal Processing, Scitech
5. S.K.Mitra, Digital Signal Processing - A Computer based approach, TMH
6. Xavier, Digital Signal Processing, S. Chand
7. Pradhan, Digital Signal Processing Applications, Jaico

MCS-1003: Elective - II (g) Advanced Computer Architecture and Parallel Computing

UNIT-I:
Advanced Computer Architecture: Introduction to Parallel Processing, Parallel Computer Structures, Pipeline and Array Computers, Multiprocessor Systems, Architectural Classification Scheme.
Interconnection network: Tree, Diamond Network, Mesh, Linear array, Ring, Star, Hypercube, Choral ring, Cube- connected cycles, perfect shuffle network, Torus, PM 21, Butterfly, Mesh of tree, Pyramid, Generalized Hyperbus, Twisted cube, Folded Hypercube, Incomplete Hypercube, Enhanced Incomplete Hypercube, Cross Connection Cube, Banyan Hypercube.

UNIT-II:
Principles of pipeline and Vector-Processing, Multification and Array Pipelines, Design of Pipelined Processors, Data buffering and busing System, Vector Processing Requirements, Pipeline Computers and Vectorization Methods, Architecture of Typical Vector Processors, Vectorization and Optimization Methods.
Structures and Algorithms for Array Processors, SIMD Array Processors, SIMD Interconnection Networks, Typical Parallel Processors, Multiprocessor Architecture, Loosely and tightly coupled Multiprocessor.

UNIT-III:
SIMD Array Processors and SIMD Inter connection networks.Principles of Parallel Computing: Message Passing Parallel Programming, PVM and MPI.Introduction to Pipelined Computations. Parallel Computation Models: PRAM, CRCW, CREW, EREW, Simulating CRCW on CREW & EREW.

UNIT-IV:
Parallel Sorting : Odd – Even transportation sort on Linear Array, Merge Splitting sorting, Quick Sort, Theorem of Odd-Even Merging, Zero- One Principle, Bitonic Sort. Matrix Multiplication: Sequential Matrix Multiplication: Row wise Block – Striped Parallel Algorithm, Cannon's Algorithm,

UNIT-V:
Parallel Search Algorithms: Parallel Depth First Search, Parallel Breadth First Search, Parallel Branch and Bound Search, Parallel Best-First Search. Not smaller-than search, Distributed Real Time System, Data Flow Computer(Static and Dynamic) Architecture, Reduced Instruction Set Computer and Architecture Characteristics.

Text Books/References::

1. K.Hwang and F.A.Briggs : Computer Architecture and Parallel Processing (McGraw Hill)
2. K.Hwang : Super Computer Design and Application (Computer Society Press)
3. Kai Hwang, "Advanced Computer Architecture – Parallelism, Scalability, Programmability", McGraw Hill Inc., 1993.
4. V.Rajaraman: Elements of Parallel Computing (PHI). (Latest Edition)
5. Barry Wilkinson and Michael Allen: Parallel Programming: Techniques and Applications (Pearson Education) Latest Edition.
6. AnanthGrama, Anshul Gupta, George Karypis and Vipin Kumar: Introduction to Parallel Computing (Latest Edition), (Pearson Education)
7. M.J.Quinn: Parallel Programming in C with MPI and Open MP: Tata MC Graw Hill.

MCS-1003: Elective – II (h) VLSI Design

UNIT-I:

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &BiCMOS technologies-Oxidation, Lithography, Diffusion, Ion implantation, Metallisation, Encapsulation, Probe testing, Integrated Resistors and Capacitors.
Basic Electrical Properties : Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, figure of merit; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT-II:

Vlsi Circuit Design Processes :VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 □ m CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT-III:

Gate Level Design : Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Basic circuit concepts, Sheet Resistance RS and its concept to MOS, Area Capacitance UNIT-s, Calculations - □ □- Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, Choice of layers

UNIT-IV
Subsystem Design : Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters, High Density Memory Elements.
Semiconductor Integrated Circuit Design :PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach.

UNIT- V
Vhdl Synthesis : VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools, Test Principles.
Cmos Testing : CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chiplevel Test Techniques, System-level Test Techniques, Layout Design for improved Testability.

TEXTBOOKS :
1. Essentials of VLSI circuits and systems – Kamran Eshraghian, EshraghianDougles and A. Pucknell, PHI, 2005 Edition.
2. Principles of CMOS VLSI Design - Weste and Eshraghian, Pearson Education, 1999.

REFERENCES :
1. Chip Design for Submicron VLSI: CMOS Layout & Simulation, - John P. Uyemura, Thomson Learning.
2. Introduction to VLSI Circuits and Systems - John .P. Uyemura, JohnWiley, 2003.
3. Digital Integrated Circuits - John M. Rabaey, PHI, EEE, 1997.
4. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
5. VLSI Technology – S.M. SZE, 2nd Edition, TMH, 2003.

MCS-1003 Elective – II(i) Cryptography

UNIT-I:
Foundations of Cryptography and Security: Approaches, Policies, Principles Ciphers and Secret Messages, Security Attacks and Services.
Mathematical Tools for Cryptography: Substitution Techniques (Caesar Ciphers, Modified Caesar Ciphers, Monoalphabetic Ciphers, Monohomophonic cipher, Polygram cipher) and Permutation Techniques (Rail Fence techniques, Simpler Columnar Techniques).

UNIT-II:
Encryption and Decryption : Basics and Techniques (Symmetric and Asymmetric key) , Steganography.
Conventional Symmetric Encryption Algorithms: Theory of Block Cipher Design, Feistel Cipher Network Structures, DES and Triple DES, Modes of Operation (ECB, CBC, OFB, CFB), Strength (or Not) of DES.

UNIT-III:
Modern Symmetric Encryption Algorithms: International Data Encryption Algorithm (IDEA), CAST, Blowfish, Twofish, RC2, RC5, Rijndael (Advanced Encryption Standard), Key Distribution. Design of Stream Cipher, One Time Pad.

UNIT-IV:
Public Key Cryptography: Prime Numbers and Testing for Primality, Factoring Large Numbers, RSA,Diffie-Hellman, ElGamal, Key Exchange Algorithms, Public-Key Cryptography Standards, Hashes and Message Digests: Message Authentication, MD5, SHA, RIPEMD, HMAC.

UNIT-V:
Digital Signatures, Certificates, User Authentication: Digital Signature Standard (DSS and DSA).
Authentication of Systems: Kerberos V4 and V5, X.509 Authentication Service.
Network Security: Firewalls, IP security, Virtual Private Networks (VPN).

Textbooks:
1. AtulKahate : Cryptography and Network Security
2. William Stallings, Cryptography and Network Security: Principles and Practice (ISBN 0131873164), 4/e
3. Bruce Schneier, Applied Cryptography (ISBN 0471128457), 2/e
4. Alfred J. Menezes , Handbook of Applied Cryptography
5. Michael Welschenbach , Cryptography in C and C++ (ISBN 1590595025), 2/e
6. Douglas R. Stinson, Chapman & Hall, Cryptography: Theory and Practice, Third Edition CRC (November 1, 2005), (ISBN: 1584885084)

References Books:
1. William Stallings, Cryptography and Network Security, 4th.Ed, Prentice Hall PTR, Upper Saddle River, NJ, 2006
2. Wenbo Mao, Modern Cryptography: Theory and Practice, Prentice Hall, 2004
3. Richard A. Mollin, An Introduction to Cryptography, Chapman and Hall/CRC, 2001.
4. B. Schneier, Applied Cryptography, John Wiley and Sons, NY, 1996.
5. A. Menezes, P. Oorshcot, and S. Vanstone, Handbook of Applied Cryptography, CRC Press, Boca Raton, FL, 1997.
6. Thomas H. Barr, Invitation to Cryptography, Prentice Hall, 2002.
7. Richard J. Spillman, Classical and Contemporary Cryptology, Prentice Hall, 2005.

MCS-1003: Elective – II(j) Operation Research and Optimization Techniques

UNIT-I:
Introduction, convexity and related results, linear programming problem, Solution by graphical and Simplex method, theory of Simplex method, optimality condition, Duality and Fundamental theorem of duality.

UNIT-II:
Two phase Simplex method, Big M method, Revised Simplex Method, Decomposition principle, Sensitivity Analysis, Parametric linear programming.

UNIT-III:
Study of transportation problem, Method for finding initial solutions (North-west corner method, Least cost method, Vogel's Approximation method), Modi method for optimum solution, Assignment problems, Hurgerian method and traveling salesman problem.

UNIT-IV:
Introduction to game theory, Maximum-minimum principle, games without saddle point, reduction to LPP, Networks Scheduling by PERT and CPM, Project cost, Time cost Optimization algorithm, Probability in PERT analysis.

UNIT-V:
Nonlinear Programming: Convex and non convex programming, Kun Tucker conditions for constrained optimization, Quadratic programming.
Integer programming: Branch and bound technique, Gomorys cutting plane method.

Text Books/References:

1. H.A. Taha, Operations Research, An introduction, PHI, 2004.
2. J.K. Sharma, Operation Research, Theory and Applications, 4^{th} edition, Mcmillan, 2009.
3. S.I. Gass, Linear Programming, Methods and Applications, 5^{th} edition, Dover publications, 2013.
4. K.P.P. Chong, S.H. Zak: An introduction to Optimization, John Welly &Sons , 2001.

MCS-1004: Project work

The Project gives an opportunity to the student to use the methodologies/techniques taught in several courses in the curriculum. A student is required to carry out individual project. The topics for the project to be undertaken by the department, after deliberations among the faculty members, shall be notified to the students. The project is to be carried out under the guidance of a faculty member of the department. A student should submit 3 copies of dissertation for evaluation at the end of the semester and present his project as a seminar topic. The external examiner in consultation with the internal examiner shall carry out the adjudication, after giving due weightage to the work carried out in the project, the presentation of the project, and viva voice. The guide/supervisor will be the internal examiner and external shall be appointed from a panel of examiners.

Marks Distribution:

Internal Assessment and Two Midterm Reviews: (40+20) = 60 marks
Dissertation: 100 marks
Presentation and Viva Voce: 40 marks
Total: 200 marks