DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS FOR MCA PROGRAMME

(CHOICE BASED CREDIT SYSTEM)

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RAJIV GANDHI UNIVERSITY,

RONO HILLS, DOIMUKH

Course Structure

FIRST SEMESTER

Proposed course code	Title	Credit (L-T-P)	Mark Distribution			
			End Semester	Sessional	Practical	Total
MCAC-401	DISCRETE MATHEMATICAL STRUCTURES	3-1-0	80	20	-	100
MCAC-402	PROBLEM SOLVING AND PROGRAMMING USING C	2-1-2	50	20	30	100
MCAC-403	PROBABILITY AND STATISTICS	3-1-0	80	20	-	100
MCAC-404	MANAGEMENT ACCOUNTANCY	3-1-0	80	20	-	100
MCAC-405	BASIC ELECTRONICS	3-1-1	50	20	30	100
TOTAL CREDIT			**22**			

SGPA1=($\sum$ CREDIT $*$ GRADE SCORED)/22

SECOND SEMESTER

Proposed course code	Title	Credit (L-T-P)	Mark Distribution			
			End Semester	Sessional	Practical	Total
MCAC-406	THEORY OF COMPUTATION	3-0-0	80	20	-	100
MCAC-407	DATA AND FILE STRUCTURE	3-0-1	50	20	30	100
MCAC-408	OBJECT ORIENTED PROGRAMMING AND DESIGN	3-0-1	50	20	30	100
MCAC-409	NUMERICAL AND STATISTICAL TECHNIQUES	3-0-1	50	20	30	100
MCAC-410	COMPUTER ORGANIZATION & ARCHITECTURE	3-1-1	50	20	30	100
TOTAL CREDIT			**20**			

SGPA2=($\sum$ CREDIT $*$ GRADE SCORED)/20

THIRD SEMESTER

Proposed course code	Title	Credit (L-T-P)	Mark Distribution			
			End Semester	Sessional	Practical	Total
MCAC-501	PRINCIPLES OF PROGRAMMING LANGUAGES	3-0-1	50	20	30	100
MCAC-502	DATABASE MANAGEMENT SYSTEM – I	3-1-1	50	20	30	100
MCAC-503	COMPILER DESIGN	3-1-1	80	20	-	100
MCAC-504	DATA COMMUNICATION	3-1-0	80	20	-	100
MCAC-505	COMPUTER GRAPHICS AND MULTIMEDIA	3-0-1	50	20	30	100
TOTAL CREDIT			**22**			

SGPA3=($\sum$ CREDIT $*$ GRADE SCORED)/22

FOURTH SEMESTER

Proposed course code	Title	Credit (L-T-P)	Mark Distribution			
			End Semester	Sessional	Practical	Total
MCAC-506	OPERATING SYSTEM	3-1-1	50	20	30	100
MCAC-507	SOFTWARE ENGINEERING	3-0-1	50	20	30	100
MCAC-508	DATABASE MANAGEMENT SYSTEM –II	3-1-1	50	20	30	100
MCAC-509	COMPUTER NETWORK	3-0-0	80	20	-	100
	ELECTIVE – I (Any One From The List)	3-0-0	80	20	-	100
MCAE-511	MANAGEMENT INFORMATIN SYSTEM					
MCAE-512	RESOURCE MANAGEMENT TECHNIQUES					
MCAE-513	ENTERPRISE RESOURCES PLANNING					
MCAE-514	ORGANIZATIONAL BEHAVIOUR					
MCAE-515	E-COMMERCE					

TOTAL CREDIT	20

SGPA4=(∑ CREDIT ∗ GRADE SCORED)/20

FIFTH SEMESTER

Proposed course code	Title	Credit (L-T-P)	Mark Distribution			
			End Semester	Sessional	Practical	Total
MCAC-601	DESIGN AND ANALYSIS OF ALGORITHMS	3-1-0	50	20	30	100
MCAE-62X	***ELECTIVE – II(Any One From The List)***	3-0-1	50	20	30	100
MCAE-621	DATA MINING					
MCAE-622	VISUAL PROGRAMMING					
MCAE-623	INTERNET AND JAVA PROGRAMMING					
MCAE-624	DESIGN & DEVELOPMENT OF EMBEDDED SYSTEMS					
MCAE-625	CLIENT / SERVER COMPUTING					
MCAE-63X	***ELECTIVE – III (Any One From The List)***	3-0-1	50	20	30	100
MCAE-631	DIGITAL SIGNAL PROCESSING					
MCAE-632	DIGITAL IMAGE PROCESSING & COMPUTER VISION					
MCAE-633	MOBILE COMPUTING					
MCAE-634	ADVANCED WEB TECHNOLOGY					
MCAE-635	ARTIFICIAL INTELLIGENCE					
MCAE-64X	***ELECTIVE –IV (Any one from the list)***	3-0-0	80	20	-	100
MCAE-641	ADVANCED COMPUTER ARCHITECTURE					
MCAE-642	OPERATIONS RESEARCH					
MCAE-	CRYPTOGRAPHY					

643						
MCAE-644	MANAGEMENT OF SOFTWARE PROJECTS					
MCAE-645	SIMULATION AND MODELING					
MCAC-605	SYSTEM PROJECT – I	0-0-4				100
TOTAL CREDIT			**20**			

SGPA5=(∑ CREDIT ∗ GRADE SCORED)/20

SIXTH SEMESTER

Proposed course code	**Title**	**Credit (L-T-P)**	**Mark Distribution**			
			End Semester	**Sessional**	**Practical**	**Total**
MCAC-606	SYSTEM PROJECT – II	0-0-16	-	-	-	400
TOTAL CREDIT			**16**			

SGPA6=(∑ (CREDIT ∗ GRADE SCORED))/16

Computation of CGPA

CGPA= (22*SGPA1+20*SGPA2+22*SGPA3+20*SGPA4+10*SGPA5+16*SGPA6)/120

Proposed course code	**Title**	**Credit (L-T-P)**	**Mark Distribution**			
			End Semester	**Sessional**	**Practical**	**Total**
MCAO-001	COMPUTER APPLICATIONS AND INFORMATION MANAGEMENT*	3-1-0	80	20	-	100

MASTER OF COMPUTER APPLICATION (MCA)

FIRST SEMESTER

MCAO-401 COMPUTER APPLICATIONS AND INFORMATION MANAGEMENT* (3-1-0)

1. Basic Concepts: Basic computer organization, Processor and memory, secondary storage devices, Input-Output devices, Computer software, Computer languages, Operating system: MS DOS, Unix (some basic commands), Data communication and computer network.

2. Word Processing and Documentation: Preparing and processing text documents, Basic word processing using Microsoft word or similar tools or products, Preparation of presentation slides.

3. Fundamentals of Database Management Systems (DBMS) : Basic Concepts of Data base Entity, Attributes of entities, Database Tables, Fields, Records, Key field, Primary Key, Basic Entity Relationships, Designing database tables, data entry forms and Designing Database Reports, Introduction to DBMS package like MS-Access.

4. Internet Services: Concept of Internet Protocol**,** Internet services, Client- server organization, FTP, HTTP, Telnet, world wide web, E-mail, Domain Name System, Uniform Resource Locator, Internet Browsers, Searching the web, Search engines, Basics of HTML and web page designing.

5. Computer Programming Basics: C Language – Character set and Tokens of C , Control Branching and Decision-Making in C - If statement Switch statement, Looping and nesting in a loop, statements in C -while ,do while, and for statements with variations, Arrays in C - Single Two - dimensional and Multi-dimensional arrays., Handling of Character Set. User Defined Functions.

Text Books

1. Sinha, P.K., *Computer Fundamentals*, (BPB Publications, 2002).

Reference Books

1. Godbole A. S., Kahate A., *Web Technologies*, (Tata McGraw-Hill, 2006)

- * This paper is Open (free choice) elective in nature. This course is offered by Department Of Computer Science And Engineering for students of other departments / Institutes of Rajiv Gandhi University. Students of Department of Computer Science and Engineering cannot choose this paper.

MCAC-401 DISCRETE MATHEMATICAL STRUCTURES (3-1-0**)**

Introduction: Logic-Prepositional Equivalences-Truth tables-Tautologies-Predicates and Quantifiers-Sets-Operations on sets-Sequences and Summations -Growth functions - relations and their properties- n-ary relations and their applications - Representation of relations-Closures of relations-Equivalence relations-Partial Orderings.

Counting Techniques: Basics of Counting- Pigeonhole Principle- Combinations and Permutations-Generalized Per mutations and Combinations-Recurrence relations-

Solving Recurrence Relations-Divide and Conquer relations- Generating Functions-Inclusion and Exclusion-Applications of Inclusion-Exclusion.

Graph Theory: Introduction to Graphs-Terminology-Relations and Directed Graphs - Representations of Graphs- Isomorphism-Connectivity- Euler and Hamiltonian Paths - Shortest Path problems- Planar Graphs - Graph Coloring- Introduction to trees- Applications of trees- Traversals-Trees and sorting-Spanning Trees-Minimum Spanning Trees.

Boolean Algebra and Models of Computation: Boolean Functions-Representing Boolean Functions -Logic Gates-Minimizations of Circuits-Languages and Grammars-Finite State Machines with and without output-Language Recognition-Turing Machines.

Books/References:

1. Discrete mathematics and its applications, Keneth. H. Rosen, Tata McGraw-Hill Publishing Company, New Delhi
2. Discrete Mathematics for computer scientists & Mathematicians, Joe L. Mott, Abraham Kandel & T. P. Baker,Prentice Hall of India Ltd, New Delhi
3. Discrete mathematics, Richard Johnsonbaug, Pearson Education, New Delhi

MCAC-402: PROBLEM SOLVING AND PROGRAMMING USING C (2-1-2**)**

INTRODUCTION: Definition of Algorithms- Writing algorithms- top down design – Program verification- The efficiency of algorithms- Concept of Recursion- some simple example to illustrate these concepts like finding the GCD of two numbers- Swapping two variables- Summation of n given numbers- generation of Fibonacci sequence- Reversing a given number-Base conversion.

INTRODUCTION TO C: C character set- Delimiters-The C Keywords-Identifiers-Constants-Variables-Rules for Defining Variables-Data Types-Declaring Variables-Initializing Variables – Type Conversion-Priority of Operators and their Clubbing-Comma and Conditional Operator-Arithmetic Operators-Relational Operators –Logical Operators-Bitwise Operators-Input and Output in C-Formatted and Unformatted Functions -Library Functions.

MORE ABOUT C : if statement- if…else statement-various forms of if- nested if -break statement-continue statement – go to statement - switch statement - nested switch statement - for statement -while statement do while statement - arrays - working with string and standard functions.

ADVANCED CONCEPTS OF C : introduction to pointers – pointer declaration – Arithmetic Operations with pointers – pointers and arrays – pointers and two-dimensional arrays – array of pointers – pointers to pointers – pointers and strings – void pointers – function definition and declaration – proto types - types of functions – call by value and reference – functions returning more values – function as an argument – function with operators – function and decision statements – function and loop statements – function with arrays and pointers – recursion – pointer to function – storage classes.

ADDITIONALS IN C: preprocessor directives – structures and unions – bit wise operators – files – command line arguments – dynamic memory allegation – graphics in

C .

PROBLEM SOVING: Reversal of an Array- Removal of duplicates in an ordered array- Partitioning of an array- Finding the kth smallest of an element of an array-Finding the longest monotone subsequence of an array-Linear search- Binary search- Hash searching- Bubble sort- merge sort- Quick sort-Insertion sort-selection sort-Text processing- Towers of Hanoi problem using recursion.

Books/References:

1. Ashok N. Kamthane, Programming with ANSI and Turbo C, Pearson Education, New Delhi.
2. R. G. Dromey, How to Solve it by Computer, Prentice Hall Of India Ltd, New Delhi.
3. N. G. Venkateshmurthy, Programming techniques through C, Pearson Education, New Delhi.
4. Byron s Gottfried**,** Programming with C, Schaum's Outline series, Tata McGraw Hill Pub. Company, New Delhi.
5. Jacqueline A. jones & Keith Harrow, C programming with problem solving, Dreamtech publications, New Delhi

MCAC-403: PROBABILITY AND STATISTICS (3-1-0**)**

Probability: Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes theorem of probability and Geometric probability.

Random variables and their properties: Discrete Random variable, Continuous Random variable, Probability Distribution joint probability distributions their properties, Transformation variables, Mathematical expectations, probability generating functions.

Probability Distributions / Discrete distributions: Binomial, Poisson Negative binominal distributions and their properties. (Definition, mean, variance, moment generating function., Additive properties, fitting of the distribution.)

Continuous distributions: Uniform, Normal, exponential distributions and their properties.

Multivariate Analysis: Correlation, correlation coefficient, Rank correlation, Regression Analysis, Multiple Regression, Attributes, coefficient of Association, □2 – test for goodness of fit, test for independence.

Estimation: Sample, populations, statistic, parameter, Sampling distribution, standard error, unbiasedness, efficiency, Maximum likelihood estimator, notion & interval estimation.

Testing of Hypothesis: Formulation of Null hypothesis, critical region, level of significance, power of the test.

Small Sample Tests: Testing equality of .means, testing equality of variances, test of correlation coefficient, test for Regression Coefficient.

Large Sample tests: Tests based on normal distribution

Books/References:

1. Probability & Statistics for Engineers and Scientists, Walpole, Myers, Myers, Ye. Pearson Education.
2. Probability, Statistics and Random Processes T.Veerarajan Tata McGraw – Hill
3. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India.

MCAC-404: MANAGEMENT ACCOUNTANCY (3-1-0**)**

Principles Of Accounting : Nature And Scope Of Accounting, Double Entry System Of Accounting, Introduction To Basic Books Of Accounts Of Sole Proprietary Concern, Closing Of Books Of Accounts And Preparation Of Trial Balance.

Final Accounts : Trading, Profit And Loss Accounts And Balance Sheet Of Sole Proprietary Concern With Normal Closing Entries. (With numerical problems)

Ratio Analysis: Meaning, Advantages, Limitations, Types Of Ratio And Their Usefulness.(Theory only) Fund Flow Statement: Meaning Of The Term Fund, Flow Of Fund, Working Capital Cycle, Preparation and Inter-preparation Of Statement.

Costing: Nature, Importance and Basic Principles.

Budget and Budgetary Control: Nature and Scope, Importance Method of Finalization and Master Budget, Functional Budgets.

Marginal Costing : Nature, Scope, Importance, Construction Of Break Even Chart, Limitations And Uses Of Break Even Chart, Practical Applications Of Marginal Costing.

(With numerical problems)

Introduction To Computerized Accounting System: Coding Logic And Codes Required, Master Files, Transaction Files, Introduction To Documents Used For Data Collection, Processing Of Different Files And Outputs Obtained.

Books/References:

1. Introduction to Accountancy. T.S.Grewal, Sultan Chand and Sons
2. Management Accountancy, S .P.Jain
3. Introduction To Accounting, G.Agarwal.

MCAC-405: BASIC ELECTRONICS (3-1-1)

Representation of Information:

Number System: Binary, octal, hexadecimal; Positive and negative numbers; fixed point and floating point quantities.

Arithmetic operations: Addition, subtraction.

Character codes: ASCII and EBCDIC, Redundant coding for error detection and correction: Concept of Hamming distance, parity codes, Hamming code.

Logic Design: Boolean algebra, Boolean variables and functions - canonical and standard forms, truth table, minimization of Boolean functions - Karnaugh map. Combinational logic circuits - AND, OR, NAND, NOR and NOT gates and tristate buffer; Implementation of Boolean functions using logic gates; Multiplexers, decoders; encoders, simple arithmetic and logic circuits.

Sequential circuits - flip-flops, shift registers and counters-synchronous and asynchronous.
Concept of bus and register transfer language.

Memory Devices: Semiconductor memory - RAM, ROM; Magnetic core and surface memory - disk, drum, tape; Access time and cost considerations: Concepts of volatility, random access, serial access, direct access, on-line and backup storage.

Books/References:

1. Mano, M.M. : Digital Logic and Computer Design, PHI (EEE)
2. Rajaraman, V.Radhakrishnan : An introduction to Digital Computer Design.-PHI (EEE).
3. Mano, M.M. ; Computer System Architecture, PHI (EEE).
4. Hamacher, Vranesic, Zaky: Computer organization, McGraw Hill.

SECOND SEMESTER

MCAC 406: THEORY OF COMPUTATION (3-0-0)

Propositional Logic, Predicate Logic, Well Formed Formulas, CNF, DNF, PDNF, PCNF, Truth tables, Alphabets, Strings, Languages, Finite Automata, State Transition Diagram, Transition Table, DFA, NFA, Equivalence of NFA and DFA, Acceptance of Strings(Languages).

Grammar, Type-0 Grammar, Context Sensitive Grammar(type-1), Context Free grammar(type-2), Regular Grammar(type-3), Construction of Regular Expression from Finite Automata, Mealy Machine, Moore Machine, Equivalent of Mealy Machine and Moore Machine and their conversion

Context free languages, sentential form, Derivation tree, leftmost derivation, rightmost derivation, Simplification of context free grammars: removal of useless symbols, removal of null productions, removal of unit productions, Normal forms: Chomsky normal form, Greibach normal form,

Push down Automata, language acceptance by final state, and acceptance by empty stack, Equivalence of PDA's and CFL's, Equivalence of acceptance by final state, and empty stack

LR(K) grammar, Turing machines, Design of TM, Acceptance by TM, Deterministic TM, Nondeterministic TM, Linear Bounded Automata, Decidability, Un-decidability.

Books/References:

1. Hopcroft JE. and Ullman JD., "Introduction to Automata Theory, Languages & Computation", Narosa.
2. K.L.P Mishra & N. Chandrasekharan – "Theory of Computer Science", PHI
3. Ash & Ash – "Discrete Mathematics",TMH
5. Lewis H. R. and Papadimitrou C. H., "Elements of the theory of Computation", P.H.I.
6. Kain, "Theory of Automata & Formal Language", McGraw Hill.
7. Linz Peter, "An Introduction to Formal Languages and Automata", Narosa

MCAC-407: DATA AND FILE STRUCTURE (3-0-1)

Data Structures:

Basic Data Structures: Arrays, Linked Lists, Stack, Queue, Dequeue, Tree, Heap, Hash Table and Collision resolution. Basic algorithms for Creation, Manipulation of Data Structures. Internal Sorting Algorithms : Bubble, Heap, Quick Sort. Tape sorting and Merging. C++ as the programming language for implementation of these algorithms.

File Structures:

Primary File Organization: Sequential, Direct, Indexed Sequential.

Multi-list File Organization, Inverted Files.

File Sorting, Hashing

Books/References:

1. Lipshutz, Data Structure, McGraw Hill.
2. Standish, Data Structure, Addison-Wesley.
3. B. Salzberg, File Structures, Prentice-Hall.
4. A.L. Tharp, File Organization and Processing, John Wiley and Sons.
5. M. Tennenbaum, Y. Langsam and M. J. Augenstein, Data Structures using C++, PHI.
6. C++ Primer Plus, Stephen Prata, Pearson, 6th Edition, 2012.

MCAC-408: OBJECT ORIENTED PROGRAMMING AND DESIGN (3-0-1**)**

Fundamentals of object oriented programming: Introduction to Object Oriented Paradigm, procedural Paradigm, An overview of classes, objects and Methods, inheritance and polymorphism.

Describe the key language features and compile and run a Java technology application, Create programs using language syntactic elements, constructs, and object-oriented paradigm

Implement exception-handling and use collections application programming interface (API), Create programs to read and write to files, Create event driven GUI using Swing

Create multithreaded Java applications, Develop Java client and server programs

Define the layers in JDBC architecture, Identify different types of JDBC drivers, Manage transactions and perform batch updates in JDBC, Create JDBC applications to access and query a database

UML: Basics, Use Case, Class, Object, Sequence, Activity, State Chart, Collaboration, Component and Deployment diagrams in Object oriented project design.

Books/References:

1. Herbert Schildt, The Complete Reference- Java, TMH Publication
2. Deitel and Deitel, Java Programming, PHI
3. E. Balagurusamy, Programming with JAVA a Primer, TMH Publication
4. Object - Oriented Modeling and Design With UML, Michael Blaha, James Rumbaugh, Pearson, 2nd Edition, 2007

MCAC-409: NUMERICAL AND STATISTICAL TECHNIQUES (3-0-1**)**

Basic Concepts: Limit, Continuity, Derivative, Convergence, Absolute Error, Relative Error, Round Off Errors, Matrix, Matrix Eigen Value Problem.

Solutions of Linear Equations- Matrics Equation, Method of Triangular Matrics, Gauss Elimination Method with pivoting, Gauss Seidel, Gauss-Jacobi.

Solution of Transcendal Equations:Method of Iteration, Bisection Method, Newton-Raphson Method, Secant Method.

Interpolation : Newton's Forward and Backward, Langrange's Interpolation

Solution of differential Equations: Picard's Method, Euler's Modified Method, Taylor's series Method, Runge-Kutta Methods, Milne's Predictor-Corrector Method, Automatic Error Monitoring and Stability of Solution.

Integration: Trapezoidal Rule, Simpson's Rules, Weddel's Rule, Tchebycheff polynomial.

Statistical Computation: Frequency Chart, Curve Fitting By Method of Least Squares, Fitting Of Straight Lines, Polynomials, Exponential Curves etc, Data Fitting With Cubic Splines, Regression Analysis, Linear And Non-Linear Regression, Multiple Regression, Statistical Quality Control Methods.

Books/References:

1. David Kincard & Ward Chenes : Numerical Analysis : Mathematics of Scientific Computing Books/Code Publishing Co.
2. Stoer, Bullrich : Computer Oriented Numerical Methods, Springer Verlag.
3. Krishnamurthy, E.V., Sen, S.K.: Computer Based Numerical Algorithms, East West Press.
4. Rajaraman, V.: Computer Oriented Numerical Methods, Prentice Hall India.

MCAC-410: COMPUTER ORGANIZATION & ARCHITECTURE (3-1-1**)**

Overview: Block diagram of a computer system, Instruction execution model.

Processor Organization: Instruction set architecture- types, formats, addressing modes; Register set; Assembly language programming.

Data path organization, Control unit design - Hardwired control, Microprogramming.

CISC and RISC architecture, Instruction pipelining.

Computer arithmetic- Review of addition and subtraction; Multiplication- Booths, Array; Division- Restoring and non-restoring; Floating point arithmetic.
Memory Organization: Interfacing of memory with processor, Memory hierarchy, Multiple-module memory, Cache memory, Virtual memory.

Input/ output Organization: Synchronization of data transfer- strobe and handshaking; I/O mapping and control- Program controlled, Interrupt driven, DMA, Interrupt and DMA mechanisms and controllers.

(Laboratory in Assembly Language Programming)

Books/References:

1. Hamacher, Vranesic, and Zaky, Computer Organization, McGraw Hill.
2. Mano M.M., Computer System Architecture, PHI(EEE).
3. Stallings, Computer Organization and Architecture, PHI(EEE).

4. Gaonkar, Microprocessor Architecture Programming Applications with 8085/8080A, Wiley Eastern.
5. Y. Yu and C. Marut, Assembly Language Programming and Organisation of the IBM PC, McGraw Hill, 1992.

THIRD SEMESTER

MCAC-501: PRINCIPLES OF PROGRAMMING LANGUAGES (3-0-1**)**

The Role of Programming Languages:- Toward Higher- level Languages, Problems of Scale, Programming Paradigms, Language Implementation Bridging the Gap

Language Description: - Syntactic Structure: Expression Notations, Abstract Syntax Trees, Lexical Syntax, Context -Free Grammars, Grammars for Expressions, and Variants of Grammars

IMPERATIVE PROGRAMMING:

Statements: Structured Programming:- The Need for Structured Programming, Syntax- Directed Control Flow, Design Considerations: Syntax, Handling Special Cases in Loops, Programming with invariants, Proof Rules for Partial Correctness, Control flow in C.

Types: Data Representation:- The Role of Types, Basic Types, Arrays Sequences of Elements, Records: Named Fields, Unions and variant Records, Sets, Pointers: Efficiency and Dynamic Allocation, Two String Tables, Types and Error Checking.

Procedure Activations:- Introduction to Procedures, Parameter-passing Methods, Scope Rules for Names, Nested Scopes in the Source Text, Activation Records, Lexical Scope: Procedures as in C, Lexical Scope: Nested Procedures and Pascal.

OBJECT ORIENTED PROGRAMMING:

Groupings of Data and Operations:- Constructs for Program Structuring, Information Hiding, Program Design with Modules, Modules and Defined Types, Class Declarations in C++, Dynamic Allocation I C++, Templates: Parameterized Types, Implementation of Objects in C++.

Object-Oriented Programming:- What is an Object?, Object- Oriented Thinking, Inheritance, Object-Oriented Programming in C++, An extended C++ example, Derived Classes and information Hiding, Objects in Smalltalk, Smalltalk Objects have self.

FUNCTIONAL PROGRAMMING:

Elements of Functional Programming:- A little Language of expressions, Types : Values and Operations, Function declarations, Approaches to Expression Evaluation, Lexical Scope, Type Checking.

Functional Programming in a Typed Languages:- Exploring a List, Function Declaration by Cases, Functions as First-Class Values, ML: Implicit Types, Data Types, Exception Handling in M, Little quit in Standard ML

Functional Programming with Lists:- Scheme, a Dialect of Lisp, The Structure of Lists, List Manipulation, A Motivating Example: Differentiation, Simplification of Expressions, Storage Allocation for Lists.

OTHER PARADIGMS:

Logic Programming:- Computing with Relations, Introduction to Prolog, Data Structures in Prolog, Programming techniques, Control in Prolog, Cuts.

An Introduction to Concurrent Programming:- Parallelism in Hardware, Streams: Implicit Synchronization, Concurrency as interleaving, Liveness Properties, Safe Access to Shared Data, Concurrency in Ada, Synchronized Access to Shared variables.

Books/References:

1. Programming Languages – Concepts & Constructs , Ravi Sethi, Pearson Education.
2. Programming Languages – Design & Implementation ,Terrance W. Pratt, Marvin V. Zelkowitz, Pearson Education.
3. Concepts of Programming Languages – Robert L. Sebesta, Pearson Education.

MCAC-502: DATABASE MANAGEMENT SYSTEM - I (3-1-1**)**

1. Database Systems Concepts And Architecture:

Introduction, data models, schemas and instance; three-schema architecture and data independence; database language and interface, the database system environment; centralized and client/server architecture of DBMSs; classification of DBMSs.

2. Data Modeling Using The E-R Model:

High-level conceptual data models for database design; Entity types, entity sets, attributes and keys; relationship types, relationship sets, roles and structural constraint; weak entity types, ER diagrams, naming conventions and design issues; Notation for UML class diagrams

3. Enhanced ER And UML Modeling:

Subclasses, super classes and inheritance; specialization and generalization; constraints and characteristics of specialization and generalization, modeling of union types using categories; representing specialization/ generalization and inheritance in UML class diagrams; relationship types of degree higher than two; data abstraction, knowledge representation and ontology concepts

4. The Relational Data Model And Relational Database Constraints:

Relational model concepts, relational model constraints and relational database schemas;

Updating operations and dealing with constraints violations

5. The Relational Algebra And Relational Calculus

Unary relational operations: SELECT and PROJECT; relational algebra operations from set theory; binary relational operations: JOIN and DIVISION; additional relational operations; the tuple relational calculus; the domain relational calculus

6. Relational Database Design By ER And EER-To-Relational Mapping:

Relational database design using ER-to-Relational mapping; mapping EER model constructs to relations

7. Functional Dependencies And Normalization For Relational Databases:

Informal design guidelines for relational schemas; functional dependencies; normal forms based on primary leys; general definitions of 2nd and 3rd normal forms; Boyce-Codd normal forms

Books/References:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Pearson Education/Addison Wesley.
2. Thomas Cannolly and Carolyn Begg, " Database Systems, A Practical Approach to Design, Implementation and Management", Pearson Education.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", McGraw Hill.
4. C.J.Date, A.Kannan and S.Swamynathan,"An Introduction to Database Systems", Pearson Education.
5. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill.

MCAC-503: COMPILER DESIGN (3-1-1**)**

Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, tool-based approach to compiler construction.

Lexical analysis: interface with input, parser and symbol table, token, lexeme and patterns. Difficulties in lexical analysis. Error reporting. Implementation. Regular definition, Transition diagrams, LEX.

Syntax analysis: CFGs, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.

Syntax directed definitions: inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions.

Type checking: type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions.

Run time system: storage organization, activation tree, activation record, parameter passing, symbol table, dynamic storage allocation.

Intermediate code generation: intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls. Implementation issues.

Code generation and instruction selection: issues, basic blocks and flow graphs, register allocation, code generation, dag representation of programs, code generation from dags, peep hole optimization, code generator generators, specifications of machine.

Books/References:

1. V. Aho, R. Sethi, and J. D. Ullman: Compilers: Principles, Techniques and Tools, PEARSON Education.

2. C. Fischer and R. LeBlanc: Crafting a Compiler in C , PEARSON Education.
3. Holub: Compiler Design in C, PHI
4. Andrew W. Appel and Maia Ginsburg: Modern Compiler Implementation in C, Cambridge Press.

MCAC – 504: DATA COMMUNICATION (3-1-0)

Overview: Objectives and Applications of Computer Communication. Computer Communication Network Architecture: ISO-OSI reference model, design philosophy, layer, protocol, interface, and service concepts. Layer-wise functionality. Physical Layer: Concepts of data transmission, modulation and multiplexing methods, modem, encoding methods, communication media, standard protocols, RS-232C,RS-449,X.21.
Medium Assess Control in broadcast networks: ALOHA, CSMA, CSMA/CD, token ring, token bus, Standard LAN Protocols (IEEE 802.X), FDDI, satellite networks. Data link layer: Framing, error control techniques, data link protocols and their performance, SDLC protocol.

Network layer: Routing, Congestion and deadlock control Algorithms, Internetworking issues and devices, gateways, bridges and routers, IP & X.25 protocols.

Books/References:

1. Tanenbaum A.S., Computer Network, PHI (EEE).
2. Behrouz A. Forouzan: Data Communications and Networking, Tata McGraw Hill.
3. William Stallings: Data and Computer Communication, Pearson Education.
4. Alberto Leon-Garcia and Indra Widjaja: Communication Networks -Fundamental Concepts and Key Architectures, Tata McGraw-Hill.

MCAC-505: COMPUTER GRAPHICS (3-0-1**)**

Introduction: Display of entities, Geometric computation and representation, Graphics Environments; Working Principles of display devices: refreshing raster scan devices, vector devices, Cathode Ray Tube Terminals, Plotters; Display of colors: Look Up Tables, display of gray shades, Half toning;

Display and drawing of graphics primitives: point, line, polygon, circle, curves and text;

Coordinate Conventions: world coordinates, device coordinates, normalized device coordinates, view-port and window, zooming and panning by changing coordinate reference frames; Computations on polygons: point inclusion problem, polygon filling, polygon intersection, clipping, polygonization of a point set, convex hull computation, triangulation of polygons; Transformations in 2D and 3D: translation, rotation, scaling, reflection, Projection: perspective and parallel projections, isometric projection, Transformation matrices;

Volume and Surface Representation: polygonal meshes, parametric curves and surfaces, Cubic and Bicubic Splines, Voxel, Octree and Medial Axis representation, Sweep

Representation, Surfaces and Volumes by rotation of curves and surfaces, fractal modeling;

Hidden surface and line elimination: Elimination of back surfaces, painters' algorithms, Binary Space Partitioning Tree; Rendering and Visualization: Shading model, Constant, Goraud and Phong Shading, Ray tracing algorithm, Radiosity Computation; Computer Animation: fundamental concepts.

Books/References:

1. James D. Foley, Andries Van dam, Steven K. Feiner & John F. Hughes, Computer Graphics – Principles and Practices, Pearson Education.
2. Donald Hearn and M Pauline Baker, Computer Graphics, PHI
3. Woo, Neider, Davis, Shreiner, “Open GL Programming Guide”, Pearson Education.
4. David F. Rogers, Procedural Elements for Computer Graphics, Tata-McGraw Hill.

FOURTH SEMESER

MCAC-506: OPERATING SYSTEMS (3-1-1)

Concepts, Processes and Threads

Operating system as an Extended Machine and as a Resource Manager, Operating system concepts (Files, Deadlocks, Memory Management, Input/Output, Processes, The Shell, Security), The evolution of Operating Systems (Serial Processing, Simple Batch Systems, Multiprogrammed Batch Systems, Mainframe Operating Systems, Server Operating Systems, Time Sharing Systems, Multiprocessor Operating Systems, Real-Time Systems, Embedded Operating Systems, Smart Card Operating), System Calls (Process Management, File Management, Directory management), Introduction to Processes (The Process Model, Process Creation, Process Termination, Process Hierarchies, Process States, Implementation of Processes, Process Control Block), Threads (The Thread Model, Thread Usage, Implementing Threads(In User Space and Kernel), Scheduler Activation, Pop Up Threads, Interprocess Communication (Race conditions, Critical Sections, Mutual Exclusion with Busy Waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message Passing), Classical IPC problems (The Dining Philosophers Problem, The Sleeping Barber Problem), Process Scheduling (Scheduling in Batch Systems, Scheduling in Batch Systems, Scheduling in Interactive Systems, Scheduling in Real-Time Systems, Thread Scheduling)

Deadlocks and Memory Management

Resources, Deadlock (Conditions for Deadlock, Deadlock modeling), Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention

Memory management without swapping or paging (Monoprogramming without swapping or paging, Multiprogramming with fixed partitions, Relocation and Protection), Swapping, Virtual Memory (Paging, Page Tables), Page Replacement Algorithms (Not-recently-used, First in first out, Second Chance page replacement algorithm, The Clock Page Replacement Algorithm, Least Recently used page replacement algorithm, The Working Set Page Replacement Algorithm, Modeling Paging Algorithms (Belady's Anomaly, Stack Algorithms, Predicting page fault rates), Design issues for Paging Systems, Implementation issues, Segmentation (Implementation of pure segmentation, Segmentation with Paging: MULTICS)

Input/Output and File Systems

Principles of I/O hardware (I/O devices, Device Controllers, Direct memory access), Principles of I/O software, I/O Software Layers, Disks (Disk hardware, disk formatting, disk arm scheduling algorithms, Error handling, Track-at-a-time caching, RAM disks) Clocks (Clock hardware, Clock software), Terminals (Terminal hardware, Input software, Output software)

Files (File Naming, File structure, File types, File access, File attributes, File operations, Memory mapped files), Directories, File System layout (Implementing files, Implementing directories, Shared files), Security (The security environment, Generic Security Attacks, Design Principles For Security, User Authentication), Protection

mechanisms (Protection Domains, Access Control Lists, Capabilities, Multilevel Security, Covert Channels), Type of File Systems (FAT, VFAT, FAT32, NTFS)

Introduction to Linux OS design –Case study

Overview of Unix, Processes in Unix (Fundamental Concepts, Process Management System Calls in Unix, Implementation of Processes in Unix), Memory Management in Unix, Input/Output in Unix, The Unix File System, Security in Unix

(***Laboratory in Shell Programming and Python***)

Books/References:

1. Tanenbaum, Modern Operating Systems, PHI (EEE)
2. Milenkovic, Operating Systems: Concepts and Design, McGraw Hill.
3. Sillberschatz et. al, Operating Systems, Wiley India.
4. W.R. Steveans, Advanced Progamming in the UNIX Environment, Addison Wesley.
5. M.J. Bach, The Design of the UNIX Operation System, PHI(EEE).
6. Singhal and Shivaratri, Advanced Concepts in Operating Systems, TMH

MCAC-507: SOFTWARE ENGINEERING (3-0-1**)**

Introduction to Software Engineering : Software development and life cycle; Project size and its categories; Planning a software project; Project-control and Project-team standards; Design of solution strategies; Software cost estimation and evaluation techniques. Software Design: Various design concepts and notations; Modern design techniques; Verification and Validation methods; Documentation and implementation procedures; Performance of software systems; Software metrics and models.

Documentation of Project-systems, manuals and implementation. Software Reliability: Definition and concept of software reliability; software errors, faults, repair and availability; Reliability and availability models; Use of database as a study tool.

Books/References:

1. R.E. Fairley, Software Engineering Concepts, McGraw-Hill.
2. D.A.Lamb, Software engineering, PHI.
3. Jalota, Software Engineering, Narosa Publishing House.
4. R.S. Pressman, Software Engineering, McGraw-Hill.
5. R. Mall, Fundamentals of Software Engineering, PHI.

MCAC-508: DATABASE MANAGEMENT SYSTEM – II (3-1-1**)**

Review of Functional Dependency, Multivalued and Project-Join dependencies, Decomposition. Normal Forms: First, Second, Third, BCNF, Fourth and PJ normal forms.

Relational Query language, Query processing, Query optimization: General strategies of optimization, Optimizing Algebraic Expression, Systematic Query optimization using cost estimate.

Concurrent Operations on the Database: Basic Concepts, A simple Transaction Model, Model with Read- and Write-Locks, Read-only, Write-only Model, Concurrency for Hierarchically Structured Items, Protection against Crashes, Optimistic Concurrency Control.

Principles of Distributed Databases, Framework for distribution. Translation of global queries into fragment queries. Query optimization and management of distributed transaction. Concurrency control and reliability in distributed databases.

Administration of Distributed Databases. Example Systems.

Spatial Databases: Data Models, various representation schemes, architectures, Query Processing, Storage Structures; Image and Multimedia Databases

Books/References:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Pearson Education/Addison Wesley.
2. Thomas Cannolly and Carolyn Begg, " Database Systems, A Practical Approach to Design, Implementation and Management", Pearson Education.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", McGraw Hill.
4. C.J.Date, A.Kannan and S.Swamynathan,"An Introduction to Database Systems", Pearson Education.
5. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill.

MCAC-509: COMPUTER NETWORKS (3-0-0**)**

Review of Computer Network Architecture and the Subnet layers.

Quality of Service: Traffic Characteristics and Descriptors – Quality of Service and Metrics – Best Effort model and Guaranteed Service Model – Limitations of IP networks – Scheduling and Dropping policies for BE and GS models – Traffic Shaping algorithms – End to End solutions – Laissez Faire Approach – Possible improvements in TCP – Significance of UDP in inelastic traffic

High Performance Networks: Integrated Services Architecture – Components and Services – Differentiated Services Networks – Per Hop Behaviour – Admission Control – MPLS Networks – Principles and Mechanisms – Label Stacking – RSVP – RTP/RTCP

High Speed Networks: Gigabit Network

Network Management: ICMP the Forerunner – Monitoring and Control – Network Management Systems – Abstract Syntax Notation – CMIP – SNMP Communication Model – SNMP MIB Group – Functional Model – Major changes in SNMPv2 and SNMPv3 – Remote monitoring – RMON SMI and MIB

Books/References:

1. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, Elsevier.
2. Behrouz A. Forouzan: Data Communications and Networking, Tata McGraw Hill.
3. William Stallings: Data and Computer Communication, Pearson Education.
4. Alberto Leon-Garcia and Indra Widjaja: Communication Networks -Fundamental Concepts and Key Architectures, Tata McGraw-Hill.

MCAE – 511: MANAGEMENT INFORMATION SYSTEM(3-0-0)

An overview of MIS Structure of a MIS Hardware, Software and Communication technology for information systems concepts of information

Storage and retrieval of data transaction processing office automation and information processing - control functions Decision making process phases in the decision making process Intelligence and design phases concepts of decision making Behavioral models of the decision maker/decision making.

System concepts system concepts applied to management information systems concepts of planning and control Organizational structure and management concepts

Decision support systems support systems for planning, control and decision making support systems for management of knowledge work Information systems requirements strategies for the determination of Information requirements.

Data base requirements user interface requirements developing and implementing application systems Quality assurance and evaluation of Information systems future developments and their organizational and social implications.

Books/References:

1. Gordon B. Davis, Margrethe H. Olson , Management Information Systems Conceptual foundations, Structure and Development , 2nd edition Mc-Graw Hill
2. James A. Senn , Analysis & Design of Information System , Second edition, McGraw Hill.

MCAE-512 RESOURCE MANAGEMENT TECHNIQUES(3-0-0)

AIM : To understand the underlying concepts of linear programming, Classical optimization theory and project scheduling.

Linear programming (LP) LP formulation and graphical solution - the simplex method - revised simplex method.

Duality and networks - definition of the dual problem - primal - Dual relationships - Dual simplex method - transportation and assignment models - transshipment models - network minimization - shortest route problems .

Integer programming - cutting plane algorithms, Branch and bound Algorithm - Multistage (dynamic) programming solution of LP by dynamic programming.

Classical optimization theory: unconstrained problem - Jacobian method - Lagrangean method - khun tucker conditions - simple problems.

Project scheduling. network diagram representation - critical path Computation - time charts and resources levelling – PERT Networks

TEXT BOOK:

1.Taha A.H.,operations research an introduction , macmillan publishing company, New york,1997.

REFERENCES:

1.Billey E. gillet, Introduction To Operations Research A Computer OrientedAlgorithmic Approach,Tata McGraw Hill,New Delhi, 1979.

MCAE-513 ENTERPRISE RESOURCE PLANNING(3-0-0)

INTRODUCTION TO ERP

Integrated Management Information System - Seamless Integration – Supply Chain Management – Integrated Data Model – Benefits of ERP – Business Engineering and ERP – Definition of Business Engineering – Principles of Business Engineering – Business Engineering with Information Technology.

BUSINESS MODELLING FOR ERP

Building the Business Model – ERP Implementation – An Overview – Role of Consultant-Vendors and Users-Customisation–Precautions–ERP Post Implementation Options-ERP Implementation Technology –Guidelines for ERP Implementation.

ERP AND THE COMPETITIVE ADVANTAGE

ERP domain MFG/PRO – IFS/Avalon – Industrial and Financial Systems – Baan IV SAP-Market Dynamics and Dynamic Strategy.

COMMERCIAL ERP PACKAGE

Description – Multi-Tier Client/Server Solutions – Open Technology – User Interface-

Application Integration.

ARCHITECTURE

Basic Architectural Concepts – The System Central Interfaces – Services – Presentation Interface – Database Interface.

TEXT BOOK:

1. Vinod Kumar Garg and N.K.Venkita Krishnan, “Enterprise Resource Planning – Concepts and Practice”, PHI, 2003.
2. Jose Antonio Fernandz, The SAP R/3 Handbook, TMH, 2006.

MCAE-514 ORGANIZATIONAL BEHAVIOUR(3-0-0)

Introduction to Organizations and Individuals. What is an organization, components of organization, nature and variety of organizations (in terms of objectives, structure etc.), models of analysing organizational phenomena, organizational and business variables, organizations in the Indian context, institutions and structures, basic roles in an organization, etc., perception, attitudes, motives (achievement, power and affiliation), commitment, values creativity and other personality factors, profile of a manager and an entrepreneur.

Interpersonal and Group Processes - Interpersonal trust, understanding the other person from his/her point of view, interpersonal communication, listening, feedback, counselling, transactional analysis, self-fulfilling prophecy, etc., leadership, motivating people, working as a member of a team, team functioning, team decision-making, team conflict resolution, team problem solving.

Organizational Structure and Integrating Interpersonal and Group Dynamics- Elements of structure, functions of structure, determinants of structures, dys functionalities of structures, structure-technology environment-people relationships, principles underlying design of organizations; organizational culture, organizational politics, issues of power and authority, organizational communications, organizational change, integrating cases(s).

Case method and lectures should be supplemented with a variety of other methodologies such as feedback on questionnaires and tests, role plays, and behaviour simulation exercise.

References

Arnold, John, Robertson, Ivan T. and Cooper, Cary, L., "Work Psychology: Understanding Human Behaviour in the Workplace", MacMillan India Ltd., Delhi, 1996.

Dwivedi, R.S., "Human Relations and Organisational Behaviour: A Global Perspective", MacMuillan India Ltd., Delhi, 1995. "

Arnold, John, Robertson, Ivan T. and Cooper, Cary, L., "Work Psychology: Understanding Human Behaviour In the Workplace", MacMillan India Ltd., Delhi, 1996.

Dwivedi, R.S., "Human Relations and Organisational Behaviour: A Global Perspective", MacMillan India Ltd., Delhi, 1995.

French and Bell (4th ed), "Organization Development: Behavioral Science Interventions for Organization Improvement", Prentice Hall of India Pvt. Ltd., New Delhi, 1994.

Hellriegel, Slocum and Woodman, "Organizational Behaviour", West Publishing Co. USA, 1986.

Hersey and Blanchard (6th 00), "Management of Organizational Behaviour: Utilising Human Resources", Prentice Hall of India Pvt. Ltd., New Delhi, 1996.

Prasad, Kesho, "Organisational Development for Excellence", MacMillan India Ltd., New Delhi, 1996.

Robbins (4th 00), "Essentials of Organizational Behaviour", Prentice Hall of India Pvt. Ltd. New Delhi, 1995.

Schermerhorn, Hunt and Osborw, "Managing Organization Behaviour", John Willey & Sons, USA. 1982.

Weston, Mergers, "Restructuring and Corporate Control", Prentice Hall of India Pvt. Ltd. New Delhi, 1995.

MCAE-515 E-COMMERCE(3-0-0)

AIM: To study the basic concepts of E-Commerce network Infrastructure- Information publishing Technology security and search Engine Service

Introduction to E–Commerce: Benefits – Impacts - Classification and Application of E-Commerce - Business Model - Architectural Frame Work

Network Infrastructure: Local Area Network – Ethernet – Wide Area Network- Internet – TCP/IP Reference Model – Domain Name System – Internet Industry structure – Information Distribution and Messaging: FTP Application – Electronic Mail – World Wide Web Server - HTTP – Web Server Implementations

Information Publishing Technology: Information Publishing – Web Browsers – HTML-CGI-Multimedia Content- Other Multimedia Objects – VRML- Securing the Business on Internet-Why Information on Internet is Vulnerable?- Security Policy-Procedures and Practices –Site Security- Protecting the Network-Firewalls-Securing the Web Service

Securing Network Transaction- Electronic Payment Systems: Introduction – Online Payment Systems – Pre–paid Electronic Payment System-Post–paid Electronic Payment System – Requirement Metrics of a Payment System

Search Engines and Directory Services: Information Directories - Search Engines – Internet Adverting – Agents in Electronic Commerce: Needs and Types of Agents – Agent Technologies – Agents Standards and Protocols – Agents Applications - Case Study.

TEXT BOOK:

1. Bharat Bhasker, 'Electronic Commerce Framework Technologies and Applications', Tata McGraw Hill Publication 2003.

REFERENCES

1. Ravi Kalakota and Andrew B Whinston, " Frontiers of Electronic Commerce ", Pearson Education Asia, 1999.(Chapters 1,2,3,6-10,16)
2. Marilyn Greenstein and Todd M Feinman , " Electronic commerce: Security, Risk Management and Control " Tata McGraw-Hill , 2000.(Chapters 7,8,10-12)

FIFTH SEMESTER

MCAC-601: DESIGN AND ANALYSIS OF ALGORITHMS (3-1-0**)**

Elementary Data Structures, Basic Computational Models.

Simple Algorithms. Analyzing Algorithms, Asymptotic Notation, Recurrence relations.

Design Methods : General Consideration, Algorithm design paradigms and representative problems: Divide and Conquer (Binary search, Merge Sort, Quick Sort, Arithmetic with Large integers, etc.), Greedy Method (Minimal Spanning Tree, Shortest Paths, Knapsack, etc.), Dynamic Programming (Chained Matrix Multiplication, Optimal Storage on Tapes, Shortest Paths, Optimal Search Trees, etc.), Backtracking (8-queens problem, Graph Colouring, Hamiltonian Cycles, etc.), Branch and Bound (0/1 Knapsack problem, Travelling Salesperson, etc.), Approximation (Graph Colouring, Task Scheduling, Bin Packing, etc.), Probabilistic Algorithms (Numerical Integration, Primality Testing, etc.).

Polynomial Evaluation and Interpolation, Fast Fourier transforms.

Intractable Problems: Basic Concepts, Nondeterministic Algorithms, NP Completeness, Cook's Theorem, Examples of NP-Hard and NP-Complete problems. Problem Reduction.

Lower Bound Techniques: Comparison tree, Reduction, Adversary argument.

Books/References:

1. Aho, J. Hopcroft and J.Ullman, The design and Analysis of Computer Algorithms, Addison Wesley.
2. E. Horowitz and S. Sahani, Fundamentals of Computer Algorithms, Galgotia, New Delhi.
3. S.E. Goodman and S.T. Hedetniemi, Introduction to the Design and Analysis of Algorithms, McGraw Hill.
4. G. Brassard and P.Bratley, Algorithmics, PHI.
5. S.K. Basu, Design Methods and Analysis of Algorithms, PHI.
6. T.H. Coremen, et. al, Introduction to Algorithm, PHI.

MCAE-621: DATA MINING (3-0-1**)**

Introduction: Basic Data Mining Tasks, Data Mining Issues, Data Mining Metrics, Data Mining from a Database Perspective. Data Mining Techniques: A Statistical Perspective on Data Mining, Similarity Measures.

Decision Trees, Neural Networks, Genetic Algorithms. *Classification*: Distance-Based Algorithms, Decision Tree-Based Algorithms.

Clustering: Similarity and Distance Measures, Partitional Techniques, Hierarchical Techniques, Density based Techniques, Clustering Large Databases, Clustering with Categorical Attributes.

Association Rules: Basic Algorithms, Parallel and Distributed Algorithms, Incremental Rules, Advanced Association Rule Techniques.

Advanced Techniques: Web Mining, Spatial Mining, Temporal Mining, Text Mining, and Applications of Data mining.

Books/References:

1. Jiawei Han and Micheline Kamber, 'Data Mining: Concepts and Techniques, Morgan Kaufmann, India
2. A K Pujari, 'Data Mining Techniques, University Press, India
3. Han, Manilla and Smyth, 'Principles of Data Mining', PHI, India
4. Pang-ning Tan, Michael Steinbach, Vipin Kumar , Introduction To Data Mining, Pearson, 1st Edition, 2007.

MCAE-622 VISUAL PROGRAMMING(3-0-1**)**

Introduction to visual programming - Concept of event driven programming – Introduction to VB .Net environment, The .NET Framework and the Common Language Runtime. Building VB.NET Applications, The Visual Basic Integrated Development Environment. Forms- properties, events. The Visual Basic Language-Console application and windows application, Data types, Declaring Variables, scope of variables, operators and statements.

Making Decisions with *If…Else* Statements, Using Select Case, Making Selections with *Switch* and *Choose, Loop statements* - *Do* Loop,for, while- The *With* Statement-Handling Dates and Times- Converting between Data Types- Arrays – declaration and manipulation- Strings & string functions - Sub Procedures and Functions.

Windows Applications-Forms- Adding Controls to Forms, Handling Events, *MsgBox* , *InputBox* , Working with Multiple Forms, Setting the Startup Form, SDI &MDI Forms, Handling Mouse & Keyboard Events, Common controls (Text Boxes, Rich Text Boxes, Labels, Buttons, Checkboxes, Radio Buttons, Group Boxes, List Boxes, Checked List Boxes, Combo Boxes, Picture Boxes, Scroll Bars, Tool Tips, Timers) - properties – methods

Object-Oriented Programming - Creating and using Classes & objects - Handling Exceptions- *On Error GoTo*- Raising an Exception- Throwing an Exception- Using Structured Exception Handling – Debugging and tracing

Data Access with ADO.NET- Accessing Data with the Server Explorer- Accessing Data with Data Adaptors and Datasets- Creating a New Data Connection- Creating and populating Dataset- Displaying Data in a Data Grid- Selecting a Data Provider- Data Access Using Data

Adapter Controls- Binding Data to Controls- Handling Databases in Code – Binding to XML data

VISUAL C++ PROGRAMMING: VC++ Components – Microsoft foundation Classes – Event Handling – Document View architecture – Menus – Dialog Boxes – Using VBX Controls – Using ActiveX Controls – Reading and Writing documents – SDI and MDI environments.

Splitter windows and Multiple views - MFC File Handling – Exception Handling – Debugging – Object Linking and Embedding – DLL – Database Management with ODBC.

Text Books:

1. Visual Basic .NET Black Book, by Steven Holzner
2. Charles Petzold, " Windows Programming", Microsoft Press, 1999.
3. Steven Holzner, "Visual C++ Programming", Second Edition, PHI Publishers, 1997.

References:

1. VB.NET for developers, By Keith Franklin, Rebecca Riordan, SAMS.
2. Sams Teach Yourself Visual Studio .NET 2005 in 21 Days, By Jason Beres
3. Learning Visual Basic .NET by Jesse Liberty
4. Visual Basic .Net programming in easy steps BY TIM ANDERSON, DreamTech Press

MCAE-623 INTERNET AND JAVA PROGRAMMING(3-0-1)

AIM: To Study about Internet, Core java. Java swing,JDBC,Java Beans and Sewlets

Internet: Internet- Connecting to Internet: Telephone- Cable- Satellite connection-Choosing an ISP- Introduction to Internet Services- E-mail Concepts- Sending and Receiving secure E-mail- Voice and Video Conferencing.

Core Java: Introduction- Operators- Data types- Variables- Arrays- Control Statements- Methods & Classes- Inheritance- package and interface- Exception handling- Multithread programming- I/O- Java Applet- String handling- Networking- Event Handling-Introduction to AWT- AWT controls- Layout managers- Menus- Images- Graphics.

Java swing: Creating a swing Applet and Application- Programming using Panes-Pluggable Look and feel- Labels- Text fields- Buttons- Toggle Buttons- Checkboxes-Radio Buttons- View Ports- Scroll Panes- Scroll Bars- List- Combo Box- Progress bars-Menus and Toolbars- Layered Panes- Tabbed Panes- Split Panes- Layouts- Windows-Dialog Boxes- Inner frame.
JDBC: The connectivity Model- JDBC/ODBC Bridge- Java.sql package- connectivity to remote database- navigating through multiple rows retrieved from a database.

Java Beans: Application Builder tools- The bean developer kit(BDK)- JAR files- Introduction- Developing a simple bean- using bound properties- The java Beans API- Session Beans- Entity Beans- Introduction to Enterprise Java Beans(EJB)- Introduction to RMI(Remote Method Invocation): A simple client-server application using RMI.

Java Servlets: Servlet basic- Servlet API basic- Life cycle of a Servlet- Running Servlet- Debugging Servlet- Thread-safe Servlet- HTTP Redirects- Cookies- Introduction to Java server pages(JSP).

TEXT BOOKS

1. Margaret Levine Young, "The Complete Reference Internet", TataMc-Graw Hill 1999
2. Herbert Schidt, "The Complete Reference JAVA2", TataMc-Graw Hill 5th edition,2002

REFERENCES

1 Balagurusamy E., "Programming with A Perimer 3e Java", TataMc-Graw Hill, 2007.
2 Dustin R. Callway, "Inside Servlets", Addison Wesley.,1999
3. Mark Watka "Using Java 2 Enterprise Edition", Que, 1st edition,2001
4. Setven Holzner, "Java2 Black Book"-Coriolis Group Books,2001

MCAE-624 DESIGN & DEVELOPMENT OF EMBEDDED SYSTEMS(3-0-1**)**

Introduction to Embedded Systems(ES), their examples and applications. Concept, Definition and Classification. Advanced hardware fundamentals. Criteria for Processor and Memory Selection for ES.

Interrupts- Basics, Shared-Data Issues, Latency. ES software architectures. Round-Robin with interrupts; Function-Queue scheduling. Issues of context, latency and deadline.

Introduction to Real-Time Operating Systems(RTOS). Tasks, Task States, Semaphores and Shared Data. Use of OS services e.g. Timer functions, Message Queues, Events, Pipes and ISRs.

Discussion of basic design using RTOS and examples. Hard Real-Time scheduling considerations. Memory and power conservation. Embedded Software Development tools: Host/Target machines, Linker/Re-Locator, Debugging Techniques.

Case study of Programming (at least one) industry-standard RTOS e.g. Micro-C/OS , VxWorks, (Embedded) Linux. Detailed study of its services and use of its API.

References:

David Simon, “An Embedded Software Primer”, Pearson (Asia).

Raj Kamal, ”Embedded Systems – Architecture, Programming & Design”, TMH.

Qing Li, “Real-Time Concepts for Embedded Systems”, CMP.

Arnold Berger, “Embedded Systems Design – An Introduction to Processes, Tools &

Techniques”, CMP.

MCAE-625 CLIENT / SERVER COMPUTING(3-0-1)

INTRODUCTION

Client Server computing and its Characteristics-Client Server Architecture-Benefits of Client Server Computing-Hardware Trends-Software Trends-Components of Client Server Applications-Classes of Client Server Applications-Categories of Client Server Applications.

THE CLIENT

Role of the Client-Client Components-Client Services-Client Operating Systems-GUI-GUI Environments-GUI Design Standards-Open GUI Standards-Database Access and Tools-Interface Independence-Testing Interfaces-Development Aids.

THE SERVER

Role of the Server-Server Functionality in Detail-Features of Server Machines-Classes of Server Machines-Layers of Software-Network Management Environment-Network Computing Environment- Server Operating System-Transaction Processing-Connectivity-Intelligent Database-Stored Procedures-Triggers-Load Leveling-Optimizer-Testing and Diagnostic Tools-Reliability-Backup and Recovery Mechanisms-Data Management Software.

THE NETWORK

Layers- Interfaces and Protocols –Standard Architectures- Network Characteristics - Network Management Standards - LAN Characteristics - LAN Hardware-Network Operating Systems.

DEVELOPMENT METHODOLOGY AND TOOLS

Convert Existing Screen Interfaces-Re_Engineering Existing Applications-Business Re_Engineering-MethodologyTools-EASELWorkbench-Ellipse-SQLWindowPowerBuilder-SQLToolset-Future of Client Server Computing.

TEXT BOOK:

1. Dawna Travis Dewire ,” Client/ Server Computing”, Tata McGraw Hill, 2003.

REFERENCES:

1. Patric Smith and Steve Guengerich,” Client /Server Computing”,Second

Edition,PHI,1997.
2. Robert Orfali, Dan Harkey, Jeri Edwards," The Essential Client/ Server survival Guide", Second Edition,Galgotia 1999.

MCAE-631: DIGITAL SIGNAL PROCESSING (3-0-1**)**

Discrete-time signals and systems.

Difference equations, z-transform.

Discrete-time processing of continuous-time signals, sampling, A/D and D/A, decimation and interpolation.
Transform analysis of linear time-invariant systems.

Structures of discrete time systems.

Filter design techniques.

Discrete Fourier series, DTFT, DFT, DFT properties, efficient computation of DFT, FFT, Goertzal algorithm, Chirp transform, decimation in time and decimation in frequency, DCT. Short-time Fourier analysis and filter banks.

Hilbert transform, Cepstral analysis, Linear prediction.

Books/References:

1. J.G. Proakis, Digital Signal Processing: Principles, Algorithms, And Applications , Pearson, 4th Edition, 2011.
2. Oppenheim, Digital Signal Processing, Pearson, 1st Edition, 2006.
3. S Sallivahanan, Digital Signal Processing , Tata McGraw-Hill, 2nd Edition, 2011
4. Ashok Ambardar, Analog and Digital Signal Processing, CL Engineering, 2nd Edition, 1999

MCAE-632: DIGITAL IMAGE PROCESSING & COMPUTER VISION (3-0-1**)**

Introduction to Image Processing & Computer Vision: Fundamentals, Purpose, Application, Image processing system components, image sensing & Acquisition, sampling & Quantization. Neighbors of a pixel adjacency connectivity, regions & boundaries, Distance Measures, stereo vision.

Image Formation: Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, stereo and multi view geometry, Binocular imaging systems.

Image Enhancement & Restoration: Spatial filtering: Intensity transformations – piece-wise linear transformations, bit plane slicing, histogram equalization, smoothing filtering masks, sharpening filters – gradient operators and Laplacian filters. Frequency domain filtering: Image sampling, 2D Discrete Fourier Transform, lowpass filteringideal and Gaussian, highpass filtering- ideal, Gaussian, Laplacian. Noise Models. Mean, median and min-max filters. Minimum mean square error filter.

Colour Image Processing: Colour models, pseudocolour, image processing, colour transformation, segmentation.

Wavelets and Multi resolution Processing: Image pyramids, subband coding, Harr transform, multi resolution expansions, discrete and continuous wavelet transforms

Image Compression: Fundamentals, Basic compression methods – Huffman, Arithmetic, LZW, run length coding schemes, Error free & Lossy compression, Standards: JPEG, JBIG

Edge and Boundary Detection: Edge detection, boundary detection, edge detection performance, boundary detection performance.

Morphological Image Processing: Erosion and dilation, opening and closing, boundary extraction, hole filling.

Motion Estimation, Detection & Tracking: Regularization theory, optical computation, Motion estimation, Structure from motion.

Shape Representation & Reconstruction: Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multiresolution analysis.

Books/References:

1. Rafael C. Gonzalez & Richard E. Woods, Digital Image Processing, Pearson Education.
2. D.Forsyth, J Ponce, Computer Vision – A Modern Approach, Prentice Hall, India
3. Anil K Jain, Fundamentals of Digital Image Processing, Prentice Hall India
4. E.Trucco, A Verri, Introductory Techniques for 3-D Computer Vision, Prentice Hall.

MCAE-633: MOBILE COMPUTING (3-0-1**)**

Introduction: Cellular networks, wireless LANs, application adaptation.

Cellular Overview : Cellular concepts, location management, handoffs.

Wireless LAN overview : MAC issues, mobile IP, ad hoc networks, TCP issues.

Applications overview : wireless applications, disconnected operations, data broadcasting, mobile agents.

GSM : Air-interface, channel structure, timing, architecture.

WAP: Architecture, protocol stack, application environment.

TCP: Asymmetric links, wireless errors, handoffs; i-tcp, snoop, link rxmit, m-tcp.

Ad hoc networks: MAC, routing, transport.

Routing: Virtual backbone, Kelpi, mobile-IP.

Data broadcasting : Push-pull, consistency.

Location management : HLR-VLR, hierarchical.

Access Technologies: Blue Tooth, GPRS, IEEE 802.11, CDMA.

QoS in Wireless

Books/References:

1. Schiller, Mobile Communications, Pearson, 2nd Edition, 2008
2. Mobile Communications, V. Jeyasri Arokiamary, Technical Publications, 1st Edition
3. Mobile Computing, Kumkum Garg, Pearson, 1st Edition, 2010
4. Mobile Computing, Raj Kamal, Oxford University Press, Usa, 1st Edition, 2008
5. Mobile Computing: Technology, Application and Service Creation, Asoke K Talukder, Hasan Ahmed, Roopa Yavagal, Tata Mcgraw Hill Education Private Limited, 2nd Edition, 2010

MCAE-634: ADVANCED WEB TECHNOLOGY (3-0-1**)**

1. Introduction to advanced web technology - Mark-up language technology (XML structures and tools), Advanced web technologies (such as AJAX and advanced web security), Searching and pattern matching using regular expressions, Issues and challenges of modern Web Technologies and Web 2.0, Advanced web topics (such as web services and Unicode)

2. Technological issues: XML processing, RDF processing

3. Taxonomies and ontologies for advanced web applications: Ontology modelling, Languages for representing ontologies on the web, Rules and inferences

4. Web services: Design and modelling of web services, Technologies for implementing web services

5. Current applications of advanced web technologies

Books/References:

1. Semantic Web Primier, Semantic Web Primier, MIT Press, 2nd Edition, 2010
2. Semantic Web Technologies: Trends and Research in Ontology-based Systems by John Davies, Rudi Studer, and Paul Warren John Wiley & Son's

3. Web Technologies: A Computer Science Perspective by Jeffrey C. Jackson, Prentice Hall, 2006.

MCAE-635: ARTIFICIAL INTELLIGENCE (3-0-1**)**

Introduction: AI problem; AI techniques, problem as a state space search, Production Systems, Issues in design of search programs.

Heuristic Search Techniques: Generate and test, Hill Climbing, Best-First Search, Problem reduction, Means- Ends analysis.

Knowledge Representation: Knowledge representation issues, Predicate logic, knowledge representation using rules, weak slot-and-Filler structure.

Natural Language Processing: Syntactic processing, semantic analysis, Discourse and pragmatic processing.

Expert Systems: Representation using domain knowledge, Expert System shell, knowledge acquisition.

Books/References:

1. Artificial Intelligence: E. Rich & K. Knight, Tata McGraw Hill.
2. Principles of Artificial Intelligence, N.J. Nilson, Narosa Pub. House.

MCAE-641: ADVANCED COMPUTER ARCHITECTURE (3-0-0**)**

Introduction: review of basic computer architecture, quantitative techniques in computer design, measuring and reporting performance. CISC and RISC processors.

Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards, and structural hazards, techniques for handling hazards. Exception handling. Pipeline optimization techniques. Compiler techniques for improving performance.

Hierarchical memory technology: Inclusion, Coherence and locality properties; Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, mapping and management techniques, memory replacement policies.

Instruction-level parallelism: basic concepts, techniques for increasing ILP, superscalar, superpipelined and VLIW processor architectures. Array and vector processors. Multiprocessor architecture: taxonomy of parallel architectures.

Centralized shared-memory architecture: synchronization, memory consistency, interconnection networks. Distributed shared-memory architecture. Cluster computers.

Non von Neumann architectures: data flow computers, reduction computer architectures, systolic architectures.

Books/References:

1. Hennessey and Patterson: Computer Architecture A Quantitative Approach, Elsevier.
2. Kai Hwang: Advanced Computer Architecture - Parallelism, Scalability, Programmability, Tata McGraw Hill.

MCAE-642: OPERATIONS RESEARCH (3-0-0**)**

Overview of operations Research: OR models – OR Techniques

Linear Programming : Introduction – Graphical solution; Graphical sensitivity analysis – The standard form of linear programming problems – Basic feasible solutions - unrestricted variables – simplex algorithm – artificial variables – Big M and two phase method – Degeneracy - alternative optima – unbounded solutions – infeasible solutions.

Dual problems : Relation between primal and dual problems – Dual simplex method

Transportation model: starting solutions. North West corner Rule - lowest cost method – Vogels approximation method – Transportation algorithms – Assignment problem – Hungarian Method.

Network Models : Definitions – CPM and PERT – Their Algorithms

Integer Programming : Branch and Bound Algorithms cutting plan algorithm.

Dynamic Programming: Recursive nature of dynamic programming – Forward and Backward Recursion

Deterministic Inventory Models : Static EOQ Models – Dynamic EOQ models.

Game theory: Two person Zero Sum Games – Mixed strategy games and their Algorithms.

Books/References:

1. Operations Research – An Introduction, Handy A Taha, Pearson Education.
2. Operations Research, Panneer Selvan, Prentice Hall of India.
3. Operation Research, Hira and Gupta, S.Chand

MCAE-643: CRYPTOGRAPHY (3-0-0**)**

Introduction to Cryptography: Terminology, Security Aspects, Attack Models, Classical Cryptography, Shift Cipher, Substitution Cipher, Vigenere Cipher, Basic Cryptanalysis

Mathematics of Cryptography: Groups, Rings, and Fields, Integer Arithmetic, Modular Arithmetic, The Euclidean Algorithm, Finite Fields of The Form GF(p), Polynomial Arithmetic, Finite Fields Of the Form GF(2^n), Linear Congruence

Introduction to Number Theory: Prime Numbers, Primality Testing, Factorization, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms

Conventional Encryption: Attacks on Encryption Schemes, Perfect Security, Cipher Machines, Modes of Operation (ECB, CBC, CFB, OFB) , Multiple Encryption , DES, Triple-DES, AES,RC4 Stream Cipher , Attacks on DES.

Pseudo-random Number Generators (PRNGs): Random and Pseudorandom Numbers, Next-bit Test, Removing Biases, ANSI X9.17 Generator Blum-Blum-Shub Generator, Statistical Tests.

Hash Functions and MAC: Standard hashes (MD5, SHA-1, SHA-256/384/512, RIPEMD-160), Birthday Attack , Collisionfreeness and recent attacks , Message Authentication Code (MAC) Algorithms , Authenticated Encryption

Key Establishment and Public-key Cryptography: Key Management, Diffie-Hellman Key Exchanga ,Attacks on Diffie Hellman, RSA, Attacks on RSA , ElGamal , Attacks on ElGamal , Semantic Security and Chosen-ciphertext Security, Provably Secure Schemes

Integrity and Digital Signature: Message Integrity, Digital Signature, Authentication Protocol, Digital Signature Standards, Attacks on Digital Signature, Variation and Applications

Books/References:

1. William Stallings, Cryptography and Network Security, Principles and Practice, Prentice Hall India.
2. Behrouz A Forouzan, Cryptography & Network Security, Tata McGraw-Hill Publications
3. Atul Kahate, Cryptography and network security, TMGH

MCAE-644: MANAGEMENT OF SOFTWARE PROJECTS (3-0-0**)**

UNIT I (12 Hours)
Managerial Issues in Software Projects: Introduction to software markets; Planning of software projects; Size and Cost Estimations; Project Scheduling; Measurement of software quality and productivity; ISO and Capability Maturity Models for organisational growth. Project management and Practice.

UNIT II (12 Hours)
Managing the systems life cycle; requirements determination, logical design, physical design. testing, implementation; system and database integration issues; metrics for project management and systems performance evaluation, managing expectations; superiors. users. team members. and other related to the project; determining skill requirements and staffing the project; cost-effectiveness analysis; reporting and presentation techniques; and effective management of both behavioural and technical aspects of the project.

UNIT III (12 Hours)
Activity Planning ;Creating Framework ; Collecting The Data ; Visualizing Progress ; Cost Monitoring ;Earned Value ; Priortizing Monitoring ; Getting Project Back To Target ; ChangeControl ; Managing Contracts ; Introduction ; Types Of Contract ; Stages In Contract Placement ; Typical Terms Of A Contract ; Contract Management ; Acceptance.

UNIT V (10 Hours)
Managing People And Organizing Teams ;Introduction ; Understanding Behavior ; Organizational Behaviour: A Background ;Selecting The Right Person For The Job ; Instruction In The Best Methods ; Motivation ; The Oldman - Hackman Job Characteristics

Model ; Working In Groups ; Becoming A Team ;Decision Making ; Leadership ; Organizational Structures ; Stress ;Health And Safety ; Case Studies.

TOTAL: 46 HOURS

Text Book

1. Bob Hughes, Mikecotterell, “Software Project Management”, Fifth Edition, Tata McGraw Hill, 2011.

References:

1. Gilb, T., "Principles of Software Engineering Management", Addison Weskey. Reading. M.A 1988.
2. Putnam. L.H . Myers. W., " Industrial Strength Software: Effective Management Using Measurement ". IEEE C.S. Press. 1997.
3. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
4. Royce, “Software Project Management”, Pearson Education, 1999.

MCAE-645: SIMULATION AND MODELING (3-0-0**)**

Definition of System: Types of systems- continuous and discrete; Modelling process and definition of a model; Verification and validation of a modeling procedure; Comparing model data with real system data; Differential and partial differential equation models; Combining discrete event and continuous models.

Simulation process; Discrete and continuous simulation methods.

Use of database and AI techniques in the area of modeling and simulation.

Books/References:

1. Gordon, G: System Simulation, Prentice Hall.
2. Payer, T.A: Introduction to Simulation, McGraw Hill.
3. Reitman, J: Computer Simulation Application, Wiley.
4. Spriet, W.A.: Computer Aided Modelling and Simulation , Academic Press.

MCAC-605: SYSTEM PROJECT – I (0-0-4**)**

SIXTH SEMESTER

CSE-C-605: SYSTEM PROJECT – II (0-0-16**)**