MCA Course Structure (New 2019-20)

FIRST SEMESTER

OPEN ELECTIVE FOR OTHER DEPARTMENT

Proposed course code	Title	Credit (L-T-P)	Mark Distribution			
			End Semester	Sessional	Practical	Total
MCAO-501	Computer Applications And Information Management*	3-1-0	80	20	-	100

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	Digital Logics	3-1-1	50	20	30	100
TOTAL CREDIT			**22**			

SGPA1=(∑ 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=(∑ CREDIT ∗ GRADE SCORED)/20

THIRD SEMESTER

Proposed course code	Title	Credit (L-T-P)	Mark Distribution			
			End Semester	Sessional	Practical	Total
	Open Electives	3-0-1	50	20	30	100
MCAC-516	Database Management System	3-1-1	50	20	30	100
MCAC-503	Compiler Design	3-1-1	80	20	-	100
MCAC-517	Computer Networks& Communications	3-1-0	80	20	-	100
MCAC-518	Computer Graphics And Multimedia (New Syllabus)	3-0-1	50	20	30	100
TOTAL CREDIT			**22**			

SGPA3=(∑ 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-519	Web Technology	3-1-1	50	20	30	100
XXXX	SWAYAM Course (Audit)	No Credit, Mandatory				
	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			**17**			
SUMMER INTERNSHIP PROGRAMME FOR 6 WEEKS			**NO credit, Grading**			

SGPA4=(∑ CREDIT ∗ GRADE SCORED)/17

FIFTH SEMESTER

Proposed course code	Title	Credit (L-T-P)	Mark Distribution			
			End Semester	Sessional	Practical	Total
MCAC-601	Design And Analysis Of Algorithms	3-1-1	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-626	Introduction to Computing using Python					
MCAE-624	Design & Development Of Embedded Systems					
MCAE-627	Introduction to Internet of Things					
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-636	Advanced Database Management System					
MCAE-637	Introduction to Robotics.					
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-643	Cryptography					
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=($\sum$ (CREDIT $*$ GRADE SCORED))/16

Computation of CGPA

CGPA=
(22*SGPA1+20*SGPA2+22*SGPA3+17*SGPA4+10*SGPA5+16*SGPA6)/120

Program Outcomes:
1. Apply the knowledge of mathematics and computing fundamentals to various real life applications for any given requirement.
2. Design and develop applications to analyze and solve all computer science related problems.
3. Design applications for any desired needs with appropriate considerations for any specific need on societal and environmental aspects.
4. Analyze and review literatures to invoke the research skills to design, interpret and make inferences from the resulting data.
5. Integrate and apply efficiently the contemporary IT tools to all computer applications.
6. Solve and work with a professional context pertaining to ethics, social, cultural and cyber regulations.
7. Involve in perennial learning for a continued career development and progress as a computer professional.
8. Function effectively both as a team leader and team member on multi disciplinary projects to demonstrate computing and management skills.
9. Communicate effectively and present technical information in oral and written reports.
10. Utilize the computing knowledge efficiently in projects with concern for societal, environmental, and cultural aspects.
11. Function competently as an individual and as a leader in multidisciplinary projects.
12. Create and design innovative methodologies to solve complex problems for the betterment of the society.
13. Apply the inherent skills with absolute focus to function as an successful entrepreneur.

FIRST SEMESTER

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

COURSE OUTCOME

PO1: It will equip the students with skills required for designing, developing applications in Information Technology.

PO2: Students will able to learn the latest trends in various subjects of computers & information technology.

PO3:The PG Diploma is aimed at graduates with a computing background and provides a detailed coverage of the key concepts and challenges in data and resource protection and computer software security.

PO4: To give hands on to students while developing real life IT application as part of the study.

PO5: To train graduate students in basic computer technology concepts and information technology applications.

PO6: Design and develop applications to analyze and solve all computer science related problems.

1. Basic Concepts: Basic computer organization, Processor and memory, secondarystorage 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 Database 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-serverorganization, 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**)**

COURSE OUTCOME

CO1: Apply the Set theory and Relation concepts.
CO2: Apply the Functions and define the recursive functions.
CO3: Apply Laplace transform to different applications.
CO4: Apply Inverse Laplace transform to different applications.
CO5: Identify the permutations and combinations.
CO6: Define variable and also identify the mapping

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**)**

COURSE OUTCOME

CO1: Write efficient algorithms to solve various problems
CO2: Understand and use various constructs of the programming language such as conditionals, iteration, and recursion
CO3: Implement your algorithms to build programs in the C programming language
CO4: Use data structures like arrays, linked lists, and stacks to solve various problems
CO5: Understand and use file handling in the C programming language

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**)**

COURSE OUTCOME

CO1: Organize, manage and present data.
CO2: Analyze statistical data graphically using frequency distributions and cummulative frequency distributions.
CO3: Analyze statistical data using measures of central tendency, dispersion and location.
CO4: Use the basic probability rules, including additive and multiplicative laws, using the terms, independent and mutually exclusive events.
CO5: Translate real-world problems into probability models.
CO6: Derive the probability density function of transformation of random variables.
CO7: Calculate probabilities, and derive the marginal and conditional distributions of vicariate random variables.
CO8: Analyze Statistical data using MS-Excel.

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**)**

COURSE OUTCOME:

CO1: Acquire conceptual knowledge of basics of accounting.
CO2: Identify events that need to be recorded in the accounting records Develop the skill of recording financial transactions and preparation of reports in accordance with GAAP.
CO3: Describe the role of accounting information and its limitations.
CO4: Equip with the knowledge of accounting process and preparation of final accounts of sole trader.
CO5: Identify and analyze the reasons for the difference between cash book and pass book balances.
CO6: Recognize circumstances providing for increased exposure to errors and frauds.
CO7: Determine the useful life and value of the depreciable asset.

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: Digital Logics(3-1-1)

COURSE OUTCOME

:CO1: Understand the concepts of various components to design stable analog circuits.
CO2: Represent numbers and perform arithmetic operations.
CO3: Minimize the Boolean expression using Boolean algebra and design it using logic gates.
CO4: Analyze and design combinational circuit.
CO5: Design and develop sequential circuits.
CO6: Translate real world problems into digital logic formulations using VHDL.

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

MCAC406: THEORY OF COMPUTATION (3-0-0**)**

COURSE OUTCOME:

CO1: UNDERSTAND, DESIGN, CONSTRUCT, ANALYZE AND INTERPRET REGULAR LANGUAGES, EXPRESSION AND GRAMMARS.

CO2: DESIGN DIFFERENT TYPES OF FINITE AUTOMATA AND MACHINES AS ACCEPTOR, VERIFIER AND TRANSLATOR. UNDERSTAND, DESIGN, ANALYZE AND INTERPRET CONTEXT FREE LANGUAGES, EXPRESSION AND GRAMMARS.

CO3: DESIGN DIFFERENT TYPES OF PUSH DOWN AUTOMATA AS SIMPLE PARSER. DESIGN DIFFERENT TYPES OF TURING MACHINES AS ACCEPTOR, VERIFIER, TRANSLATOR AND BASIC COMPUTING MACHINE.

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**)**

COURSE OUTCOME

CO1: Students will be able to choose appropriate advanced data structure for given problem.

CO2: Students will be able to calculate complexity.

CO3: Students will be able to select appropriate design techniques to solve real world problems.

CO4: Students will able to apply the dynamic programming technique to solve the problems.

CO5: Students will be able to apply the greedy programming technique to solve the problems.

CO6. Students will be able to select a proper pattern matching algorithm for given problem

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**)**

COURSE OUTCOME:

CO1: Analyze and explain the behavior of simple programs involving the following fundamental programming constructs: assignment, I/O (including file I/O), selection, iteration methods.

CO2: Write a program that uses each of the following fundamental programming constructs: assignment, I/O (including file I/O), selection, iteration, methods.

CO3: Break a problem into logical pieces that can be solved (programmed) independently.

CO4: Develop, and analyze, algorithms for solving simple problems.

CO5: Use a suitable programming language, and development environment, to implement, test, and debug algorithms for solving simple problems.

CO6: Write programs that use each of the following data structures (and describe how they are represented in memory): strings, arrays.

CO7: Explain the basics of the concept of recursion.

CO8: Write, test, and debug simple recursive functions and procedures.

CO9: Explain and apply object-oriented design and testing involving the following concepts: data abstraction, encapsulation, information hiding, inheritance and polymorphism.

CO10: Use a development environment to design, code, test, and debug simple programs, including multi-file source projects, in an object-oriented programming language.

CO12: Implement basic error handling.

CO13: Solve problems by creating and using sequential search, binary search, and quadratic sorting algorithms (selection, insertion).

CO14: Determine the time complexity of simple algorithms.

CO15: Apply appropriate problem-solving strategies.

CO15: Use APIs (Application Programmer Interfaces) and design/program APIs

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**)**

COURSE OUTCOME

CO1: Describe and discuss the key terminology, concepts tools and techniques used in business statistical analysis.

CO2: Critically evaluate the underlying assumptions of analysis tools.

CO3: Understand and critically discuss the issues surrounding sampling and significance.

CO4: Discuss critically the uses and limitations of statistical analysis.

CO5: Solve a range of problems using the techniques covered.

CO6: Conduct basic statistical analysis of data.

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 TranscendalEquations: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**)**

COURSE OUTCOME:

CO1: Describe basic organization of computer and the architecture of 8086 microprocessor.

CO2: Implement assembly language program for given task for 8086 microprocessor.

CO3: Demonstrate control unit operations and conceptualize instruction level parallelism.

CO4: Demonstrate and perform computer arithmetic operations on integer and real numbers.

CO5: Categorize memory organization and explain the function of each element of a memory hierarchy.

CO6: Identify and compare different methods for computer I/O mechanisms.

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-516: DATABASE MANAGEMENT SYSTEM (3-1-1)

COURSE OUTCOME:

CO1: Explain the features of database management systems and Relational database.

CO2: Design conceptual models of a database using ER modelling for real life applications and also construct queries in Relational Algebra.

CO3: Create and populate a RDBMS for a real life application, with constraints and keys, using SQL.

CO4: Retrieve any type of information from a data base by formulating complex queries in SQL.

CO5: Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.

CO6: Build indexing mechanisms for efficient retrieval of information from a database.

Basic concepts

Database & Database Users.Characteristics of the Database Approach advantages of using DBMS.Data Models, Schemas & Instances.DBMS Architecture & Data independence. SystemArchitecture for DBMS and Data Dictionary, Database Users Data Base languages &Interfaces.Data Modeling using the Entity-Relationship Model -Entity types, Entity Sets, Attributes andKeys, Relationship, Relationship Types, Week Entity Types, Structural Constraints, EnhancedER Model- Specialization Generalization, Constraints on Specialization Generalization.

Relational Model, Languages & Systems

Relational Data Model Concepts and Constraints. Relational Algebra - select, project, set theoretic, joinoperations. Overview of Relational Calculus.SQL - A Relational Database Language. Data Definitioncommands, View and Queries , transaction commands,Specifying Constraints & Indexes in SQL.

Relational Data Base Design

Function Dependencies & Normalization for Relational Databases. Informal design guidelinesfor relation schemas, Functional Dependencies. Normal forms based on primary keys (INF, 2NF,3NF& BCNF). Lossless join & Dependency preserving decomposition. Multivalueddependencies, join dependencies (4NF & 5NF), Denormalization.

Transactions, Concurrency Control, Recovery Techniques

Basic concept; ACID properties; transaction state; implementation of atomicity and durability; concurrentexecutions; basic idea of serializability; view and conflict serializabllity Recovery Techniques FailureClassification , Storage Structure, Recovery and Atomicity Log Based Recovery, ShadowPaging ,stable storage implementation, data access; recovery and atomicity - log based recovery,deferred database modification, immediate database modification, checkpoints.

Emerging fields in DBMS
Distributed databases; Basic idea; distributed data storage; data replication; data fragmentation horizontal,vertical and mixed fragmentation. Concepts of Multimedia databases, Object oriented data basemanagement systems. Data Warehousing & mining.

Text Books
1. Elmsari and Navathe, "Fundamental of Database System", Addison Wesley. New York.
2. H.Korth& A. Silberschatz, “DATABASE SYSTEM CONCEPTS”, TMH.
Reference Books
1. Date. CJ, "An Introduction to Database System", Narosa Publishing House. New Delhi.
2. Desai, B, "An Introduction to Database Concepts", Galgotia Publications. New Delhi.

1. Ullman. J.D, "Principles of Database Systems", Galgotia Publications, New Delhi.

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

COURSE OUTCOME:

CO1: Specify and analyzer the lexical, syntactic and semantic structures of advanced language features

CO2: Separate the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation

CO3: Write a scanner, parser, and semantic analyzer without the aid of automatic generators

CO4: Turn fully processed source code for a novel language into machine code for a novel computer

CO5: Describe techniques for intermediate code and machine code optimization

CO6: Design the structures and support required for compiling advanced language features.

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 – 517: COMPUTER NETWORKS AND COMMUNICATION (3-1-0)

COURSE OUTCOME:

CO1: Understand and explain the concept of Data Communication and networks, layered architectureand theirapplications.

CO2: Analyse and Set up protocol designing issues for Communication networks.

CO3: Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction

CO4: Apply various network layer techniques for designing subnets and supernets and analyse packet flow on basis of routing protocols.
CO5: Estimate the congestion control mechanism to improve quality of service of networking application.

CO6: Understand and design application layer protocols and internet applications such as network security, Email and DNS,

Introduction

Layered Network Architecture, Review of ISO-OSI Model, Introduction to CP/IP Model.; Data Communication Techniques; Pulse Code Modulation (PCM), Differential Pulse Code Modulation (DPCM), Delta Modulation (DM).; Multiplexing Techniques; Frequency Division, Time Division, Statistical Time Division Multiplexing.; Physical Layer: Transmission Media: Wires, Cables, Radio Links, Satellite Link, Fiber Optic.; Error Detection and Correction: Single and Burst Error, parity Check Codes, Cyclic Redundancy Code & Hamming Code.

Data Link Layer Protocols

Stop and Wait Protocols: Noise free and Noisy channels, performance and efficiency, Sliding Window Protocols: Go Back and Selective Repeat ARQS, performance and efficiency, verification of protocol., HDLC and ATM: HDLC data link protocol, ISDN, Channel Structure, Asynchronous Transfer Mode (ATM), ATM Cells, Header and Cell Format. Layers in ATM Class 1,2,3,4 traffic.

Medium Access Control Sub layer

Concept of Random Access, Pure ALOHA throughput characteristics of ALOHA Throughputs for finite and infinite populations S-ALOHA., LAN: IEEE 802.3, 802.4 and 802.5 Protocols performance of Ethernet. Token Ring Protocol, FDDI Protocol, Distributed Queue Dual Bus (DQDB) Protocol.

Network and Transport Layer Protocols

General Principles, Virtual circuits and datagram's, Windows flow control, Packet Discarding, Traffic Shaping, Choke RSVP, Network Layer in ATM, Internetworking using Bridge, Routers and Gateways, Routing Algorithms: Optimality principle, shortest path routing-Dijkstra, Flooding and broadcasting, distance vector routing, link state routing, flow based routing, Multicasting routing flow and congestion control. Internet Architecture and Addressing. Transport Layer: Design issues, Quality of Services, Primitives Connection Management: Addressing, Connection Establishment and Releases. Flow control and Buffering, Crash recovery, Element of TCP/IP protocol: User Data gram Protocol, (UDP/TCP) Layering.

Presentation And Application Layer Protocols

Presentation concepts SNMP Abstract Syntax notation. I (ASN-I), Cryptography: Substitutions and Transposition, Ciphers, Data Encryption Standard (DES), DES Chaining, Breaking DES, Public Key Cryptography, Authentication Protocols.

Text Books :

1. A. S. Tanenbaum "Computer Network: Second Ed. Prentice Hall, India (tan).

2. B. A. Frouzan, Data Communication, Tata McGraw Hill.

Reference: 1. D. Berekas an R. Gallager, "Data Networks:, second Ed. Prentice Hall, India.

2. D. E. Coner, "Intertworking with TCP/IP", Vol-I.Prentice Hall India.

3. G. E. Keiser, “Local Area Network”, McGraw Hill, International Ed.

4. W. Stalling, “Data & Computer Communications”, Maxwell Macmillan Internation Ed.

MCAC-518: COMPUTER GRAPHICS (3-0-1**)**

COURSE OUTCOME:

CO1: Have a basic understanding of the core concepts of computer graphics.

CO2: Be capable of using OpenGL to create interactive computer graphics.

CO3: Understand a typical graphics pipeline.

CO4: Have made pictures with their computer.

Introduction: A Survey of Computer Graphics- Computer Aided Design, Presentation Graphics, Computer Art, Entertainment, Education and Training, Visualization, Image Processing, Graphics User Interface;

Overview of Graphics Systems : Video Display Devices – Refresh Cathode-Ray Tubes, Raster-Scan Displays, Random-scan Displays, Color CRT Monitors, Direct-View Storage Tubes, Flat-Panel Displays, Three-Dimensional Viewing Devices, Stereoscopic and Virtual-Reality Systems; Raster-Scan Systems; Random-Scan Systems; Graphics Monitors and Workstations; Input Devices;

Display and drawing of graphics primitives: Points and Lines; Line Drawing Algorithms- General Line Equation, DDA Algorithms, Bresenham’s Line Algorithm; Circle-Generating Algorithm- Equation of a Circle, Bresenham’s Circle Algorithm; Curves and Text;

Filled Area Primitives : Scan-Line Polygon Fill Algorithm, Boundary-Fill Algorithm, Flood-Fill Algorithm

Geometric Transformations : Basic 2D Transformations – Translation, Rotation, Scaling; Matrix Representation and Homogeneous Coordinates; Translation along x-axis, y-axis; Rotation about origin, Rotation about a pivot point; Scaling about origin, Scaling relative to a fixed Point; Three Dimensional Transformations

Two-Dimensional Viewing : Coordinate Conventions-world coordinates, device coordinates, normalized device coordinates, view-port and window; Clipping Operations – Point Clipping, Line Clipping, Cohen-Sutherland Line Clipping, Polygon Clipping, Sutherland-Hodgeman Polygon Clipping, Other Polygon-Clipping Algorithms, Transformations in 2D and 3D: translation, rotation, scaling, reflection, Projection: perspective and parallel projections, isometric projection, Transformation matrices;

Volume and Surface Representation, Fractal modelling; Hidden surface and line elimination; 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: OPERATINGSYSTEMS (3-1-1)

COURSE OUTCOME:

CO1: Describe the important computer system resources and the role of operating system in their management policies and algorithms.

CO2: Understand the process management policies and scheduling of processes by CPU.

CO3: Evaluate the requirement for process synchronization and coordination handled by operating system.

CO4: Describe and analyze the memory management and its allocation policies.

CO5: Identify use and evaluate the storage management policies with respect to different storage management technologies.

CO6: Identify the need to create the special purpose operating system

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. Sillberschatzet. 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**)**

COURSE OUTCOME:

CO1: Define various software application domains and remember different process model used in software development.

CO2: Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques.

CO3: Convert the requirements model into the design model and demonstrate use of software and user interface design principles.

CO4: Distinguish among SCM and SQA and can classify different testing strategies and tactics and compare them.

CO5: Justify role of SDLC in Software Project Development and they can evaluate importance of Software Engineering in PLC.

CO6: Generate project schedule and can construct, design and develop network diagram for different type of Projects. They can also organize different activities of project as per Risk impact factor

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-519: WEB TECHNOLOGY (3-1-1**)**

COURSE OUTCOMES

CO 1: Students are able to develop a dynamic webpage by the use of java script and DHTML.

CO 2:*Students will be able to write a well formed / valid XML document.*

CO 3:*Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.*

CO 4: *Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.*

HTML –

What is HTML – Basic Structure of HTML Page – Basic Tags – Types of Tags – Lists – Tables – Images – Forms – Frames.

Dynamic HTML with Java Script:

Data validation, Opening a new window, Messages and Confirmations, The status bar, Writing to a different frame, Rollover buttons, Moving images, Multiple pages in a single download, A text-only menu system, Floating logos.

Cascading Style Sheet:

Introduction – A Simple Specification – Types of Style Sheets – Inline Style Sheets – Internal or embedded style sheets – External Style Sheets – Style Classes – Font Properties – Background properties – Border properties – text properties – margin properties – padding properties – table properties – positioning properties – line/marker properties – outlines – classification.

JAVA SCRIPT:

Introduction – Usage of variables – operations – control structures – looping structures – predefined keywords – arrays – predefined functions – user defined functions – arrays and functions – mathematical functions – string functions – objects – expressions – pattern matching using RegEXp Class – String Class – Exception Handling – Built–in objects – Bgcolor/Fgcolor – Date Object – Events and Event Handling – Validations – Window – Confirmation, alert messages.

XML :

Introduction –Document Type Definition or DTD – uses of DTD – Tags – Elements – Attributes – PCDATA – CDATA – Basics of entities – XML Elements – Elements Declaration –usage of #REQUIRED – usage of #IMPLIED – usage of #FIXED – Internal Entities – External Entities – XML Schema – Defining, Accessing XML Document.

Prescribed Book:

1. Chris Bates, Web Programming Building Internet Applications, Second Edition, Wiley (2007)

Reference Books:

1. Paul S.WangSanda S. Katila, An Introduction to Web Design Plus Programming, Thomson(2007).

2. Robert W.Sebesta, Programming the World Wide Web, Third Edition, Pearson Education (2007).

3. Thomas A.Powell, The Complete Reference HTML & XHTML, Fourth Edition, Tata McGraw Hill (2006).

4. Abders Moller and Michael Schwartzbach, An Introduction to XML and Web Technologies, Addison Wesley (2006).

5. Joel Sklar, Principles of Web Design, Thomson (2007).

6. Raj Kamal, Internet and Web Technologies, Tata McGraw Hill (2007).

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

COURSE OUTCOME:

CO1: Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making.

CO2: Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives.

CO3: Effectively communicates strategic alternatives to facilitate decision making

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)

COURSE OUTCOME:

CO1: To develop the understanding of the concept of human resource management and to understand its relevance in organizations.

CO2: To develop necessary skill set for application of various HR issues.

CO3: To analyze the strategic issues and strategies required to select and develop manpower resources.

CO4: To integrate the knowledge of HR concepts to take correct business decisions.

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.TahaA.H.,operations research an introduction , macmillan publishing company, New york,1997.

REFERENCES:

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

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

COURSE OUTCOME:

CO1: Understand and gain insight into process views of organizations and tools and techniques used to model both as-is and to-be models.

CO2: Apply the process models techniques in one or more modeling environments.

CO3: Know and be able to apply key technical terminology in enterprise information systems as they apply in different ERP products and development methods.

CO4: Understand key differences between the major ERP applications (such as SAP R/3, and Oracle/PeopleSoft/Sibel) and issues specific to these applications their configuration and management.

CO5: Analyze a current architecture and perform an effective gap analysis before an ERP implementation.

CO6: Be able to map enterprise architectural resources to a contemporary Enterprise Architecture mapping tool.

CO7: Understand and be able to articulate the life cycle stages of any ERP implementation.

CO8: Effectively describe problems typical of ERP implementation projects and translate this information and use this information to anticipate and articulate the challenges associated with post-implementation management of ERP systems.

CO9: Synthesize prior theoretical and experiential knowledge in IT development and project management with the current literature on Enterprise System development.

CO10: Be able to evaluate the progress of an ongoing ERP implementation project.

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)

COURSE OUTCOME:

CO1: May discuss the main purpose of this course and scientific foundations of O.B.

CO2: Analyze five conceptual anchors of O.B.

CO3: Identify personal dimensions of personality, job satisfaction, motivation and learning.

CO4: May analyze the group formation and management process.

CO5: Discuss group and group dynamics.

CO6 Examine group types and team working techniques.

CO7: May describe the basic subjects for improving the performance of employees and organizations.

CO8: Evaluate the developments of basic conflict resolutions.

CO9: Discuss the main problems about stress, power and politics and ethics.

CO10: Improve and develop strategies about organizational change and development.

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 OrganisationalBehaviour: A Global Perspective", MacMuillan India Ltd., Delhi, 1995. "

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

Dwivedi, R.S., "Human Relations and OrganisationalBehaviour: 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)

COURSE OUTCOME:

CO1: Demonstrate an understanding of the foundations and importance of E-commerce.

CO2: Demonstrate an understanding of retailing in E-commerce by:

- analyzing branding and pricing strategies,
- using and determining the effectiveness of market research
- Assessing the effects of disintermediation.

CO3: Analyze the impact of E-commerce on business models and strategy.

CO4: Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational.

CO5: Describe the infrastructure for E-commerce.

CO6: Describe the key features of Internet, Intranets and Extranets and explain how they relate to each other.

CO7: Discuss legal issues and privacy in E-Commerce.

CO8: Assess electronic payment systems.

CO9: Recognize and discuss global E-commerce issues

AIM: To study the basic concepts of E-Commerce network Infrastructure-Informationpublishing 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)

COURSE OUTCOME:

CO1: Argue the correctness of algorithms using inductive proofs and invariants.

CO2: Analyze worst-case running times of algorithms using asymptotic analysis.

CO3: Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.

CO4: Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.

CO5: Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.

CO6: Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.

CO7: Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.

CO8: Analyze randomized algorithms. Employ indicator random variables and linearity of expectation to perform the analyses. Recite analyses of algorithms that employ this method of analysis.

CO9: Explain what amortized running time is and what it is good for. Describe the different methods of amortized analysis (aggregate analysis, accounting, potential method). Perform amortized analysis.

CO10: Explain what competitive analysis is and to which situations it applies. Perform competitive analysis.

CO11: Compare between different data structures. Pick an appropriate data structure for a design situation.

CO12: Explain what an approximation algorithm is, and the benefit of using approximation algorithms. Be familiar with some approximation algorithms, including algorithms that are PTAS or FPTAS. Analyze the approximation factor of an algorithm

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)

COURSE OUTCOME:

CO1: Understand Data Warehouse fundamentals, Data Mining Principles.

CO2: Design data warehouse with dimensional modeling and apply OLAP operations.

CO3: Identify appropriate data mining algorithms to solve real world problems.

CO4: Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining.

CO5: Describe complex data types with respect to spatial and web mining.

CO6: Benefit the user experiences towards research and innovation integration

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 MichelineKamber, '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**)**

COURSE OUTCOME:

CO1: Students list the visual programming concepts.

CO2: Explain basic concepts and definitions.

CO3: Express constants and arithmetic operations.

CO4: Distinguish variable and data types.

CO5: Students code visual programs by using Visual Basic work environment.

CO6: Distinguish and compose events and methods.

CO7: Recognize and arrange control structures.

CO8: Design a complete program using visual programming concepts.

CO9: Students prepare various projects by helping visual programming.

CO10: Prepare project in visual programming.

CO11: Manage and analyze prepared project with programs.

CO12: Interpret and report obtaining results

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.

Books/References:

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

MCAE-626 INTRODUCTION TO COMPUTING USING PYTHON (3-0-1**)**
COURSE OUTCOMES

CO 1: to learn and understand python programming basics and paradigm.

CO 2: to learn and understand python looping, control statements and string manipulations.

CO 3: students should be made familiar with the concepts of gui controls and designing gui applications.

CO 4:to learn and know the concepts of file handling, exception handling and database connectivity

Understanding Python variables, Python basic Operators, python blocks , Data Types, Declaring and using Numeric data types: int, float, complex Using string data type and string operations

Defining list and list slicing Use of Tuple data type: Python Program Flow Control Conditional blocks using if, else and elif Simple for loops in python, For loop using ranges

String, list and dictionaries Use of while loops in python Loop manipulation using pass, continue, break and else Programming using Python conditional and loops block

Python Functions, Modules And Packages, Organizing python codes using functions

Organizing python projects into modules, Importing own module as well as external modules Understanding Packages Powerful Lamda function in python, Programming using functions, modules and external packages, Python String, List And Dictionary Manipulations.

Books/References:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, Cengage Learning, ISBN: 978- 1111822705.

2. David Beazley , Brian K. Jones "Python Cookbook", 3rd Edition. O'Reilly Publications
3. Jake VanderPlas "Python Data Science Handbook" O'Reilly Publications
4. David Beazley, "Python Essential Reference (4th Edition) " Addison Wesley
5. Vernon L. Ceder," The Quick Python Book, Second Edition", Manning Publications
6. Brett Slatkin ,"Effective Python

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

COURSE OUTCOME:

CO1: Know what an embedded system is.

CO2: Basic understanding of General System Theory (GST), how this applies to embedded system engineers, and how this differs from the traditional mechanistic theory.

CO3: Understand the general process of embedded system development

CO4: Comprehend important embedded system terminology

CO5: Experience common aspects of embedded system development

CO6: Understanding of what an embedded system R&D project is, and the activities it involves

CO7: Experience of embedded system product conceptualization methods and think tanks

CO8: Suggestion of own product concepts

CO9: Understanding of a concept presentation

CO10: Ability to use ANSI C to develop embedded software

CO11: Use of ESAOA Framework to facilitate implementation and knowledge management of embedded software R&D projects

CO12: Interface to peripherals, knowledge of typical interfacing standards.

CO13: Development of prototype circuit on breadboard (including interfacing to microcontroller, and control from software)

CO14: Use of RT UML for system level, hardware, and software modeling, used to: refine concepts, produce system designs, and express ideas

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.

Books/References:

1. David Simon, "An Embedded Software Primer", Pearson (Asia).
2. Raj Kamal, "Embedded Systems – Architecture, Programming & Design", TMH.
3. "Real-Time Concepts for Embedded Systems", CMP.
4. Arnold Berger, "Embedded Systems Design – An Introduction to Processes, Tools & Techniques", CMP.

MCAE-627 INTRODUCTION TO INTERNET OF THINGS(3-0-1**)**

OVERVIEW:

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management,

Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

REFERENCE ARCHITECTURE:

IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference ArchitectureIntroduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS:

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART,Z-Wave,Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP UNIT IV – TRANSPORT & SESSION LAYER PROTOCOLS (12 hours) Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

SERVICE LAYER PROTOCOLS & SECURITY

Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer

Books/References:

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1 st Edition, Academic Press, 2014.
3. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI
4. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-onApproach)”, 1st Edition, VPT, 2014.

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

COURSE OUTCOME:

CO1: Knows basic discrete-time signal and system types, convolution sum, impulse and frequency response concepts for linear, time-invariant (LTI) systems, difference equation realization of LTI systems and discrete-time Fourier transform and basic properties of these.

CO2: Understands periodic sampling of analog signals and the relation between Fourier transforms of the sampled analog signal and the resulting discrete-time signal.

CO3: Grasps z and inverse z transform, region of convergence concepts and their properties, performs simple transform calculations, and understands the system function concept with its relations to impulse and frequency responses.

CO4: Understands the basic properties of system functions and frequency responses of LTI systems, minimum-phase, all-pass and linear-phase systems.

CO5: Understands signal flow graph and block diagram representations of difference equations that realize digital filters: (i) Learns direct forms 1 and 2 for IIR filter realization. (ii) Learns direct form for FIR filter realization.

CO6: Understands definitions and basic properties of forward and inverse discrete Fourier transform and their computation by fast algorithms.

CO7: Learns basic digital filter design methods: (i) Learns analog Butterworth and Chebyshev filters transformed to yield digital IIR filters, (ii) impulse-invariance and bilinear transformation methods for IIR filter design and (iii) FIR filter design methods based on windowing.

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**)**

COURSE OUTCOME:

CO1: Understand the basic theory and algorithms that are widely used in digital image processing.

CO2: Understand image analysis algorithms.

CO3: Understand current applications in the field of Image Processing.

CO4: Develop hands-on experience in using computers to process images

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, lowpassfilteringideal 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, AVerri, Introductory Techniques for 3-D Computer Vision, Prentice Hall.

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

COURSE OUTCOME:

CO1: Determine solutions using problem solving principles, logic and systematic methodologies.

CO2: Evaluate the architecture and principles of operation of computer systems and networks.

CO3: Synthesize principles and theories of computer science and software engineering for application to different computing paradigms.

CO4: Design and develop software systems for various application domains.

CO5: Design and develop secure enterprise-grade information systems.

CO6: Manage the development of software systems through a variety of development processes and methodologies.

CO7: Design effective user interfaces using human computer interaction principles.

CO8: Synthesize new knowledge in the field of computer science by using appropriate research methodologies.

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. JeyasriArokiamary, Technical Publications, 1st Edition
3. Mobile Computing, KumkumGarg, 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, RoopaYavagal, Tata Mcgraw Hill Education Private Limited, 2nd Edition, 2010

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

COURSE OUTCOME:

CO1: Students are able to develop a dynamic webpage by the use of java script and DHTML.

CO2: Students will be able to write a well formed / valid XML document.

CO3: Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.

CO4: Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.

CO5: Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

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**)**

COURSE OUTCOME:

CO1: Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.

CO2: Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.

CO3: Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing.

CO4: Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.

CO5: Formulate and solve problems with uncertain information using Bayesian approaches.

CO6: Apply concept Natural Language processing to problems leading to understanding of cognitive computing

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-636: ADVANCED DATABASE MANAGEMENT SYSTEM(3-0-1**)**

COURSE OUTCOME:

CO1: Describe basic organization of computer and the architecture of 8086 microprocessor.

CO2: Implement assembly language program for given task for 8086 microprocessor.

CO3: Demonstrate control unit operations and conceptualize instruction level parallelism.

CO4: Demonstrate and perform computer arithmetic operations on integer and real numbers.

CO5: Categorize memory organization and explain the function of each element of a memory hierarchy.

CO6: Identify and compare different methods for computer I/O mechanisms

Advance Database Management System-Concepts and Architectures : Centralized, Client-Server , Server System, Parallel, Distributed, Web Based Systems
Parallel Databases : Introduction to Parallel Databases, Parallel Database Architecture , Input-Output
Parallelism , Interquery and Intraquery Parallelism, Interoperational and Intraoperational Parallel ism , Design of Parallel Systems, Parallelism on Multicore Processors

Distributed Database: Introduction to Distributed Databases,Distributed DBMS Architectures, Homogeneous and Heterogeneous Databases, Distributed Data Storage , Distributed Transactions , Commit Protocols , Availability , Cloud Based Database, Concurrency Control and Recovery in Distributed Databases
Data Warehousing : Introduction to Data Warehousing,Architecture ,Dimensional Data Modeling , OLAP, OLAP and Data Cubes , Data Preprocessing

Knowledge Base Systems and Data Mining : Knowledge Discovery in Databases (KDD), Association Rules , Market Basket Model and Confidence

Books/References:

1. Raghu Ramakrishnan, Johannes Gerhke, “Database Management Systems” McGraw Hill.
2. Decision support & database system –Efrem G. Mallach.
3. Datawarehousing fundamental – PaulrajPonniah Wiley.
4. Introduction to data mining with case studies – G.K. Gupta.
5. Elmasri and Navathe, “Fundamentals of Database Systems”, Person Education.
6. Korth, Silberchatz, Sudarshan, “Database System Concepts” McGraw Hill.
7. Peter Rob and Coronel, “Database Systems, Design, Implementation and Management”, Thomson Learning.
8. Data Warehousing (OLAP) S. Nagabhushana New Age.

MCAE-637: INTRODUCTION TO ROBOTICS(3-0-1**)**

CO 1: Understand the importance of embedded systems and robotics in our daily life.

CO 2: Identify different embedded devices.Co-related embedded systems with their university courses.

CO 3: Identify different components of embedded systems and robotics.Know about different features of a microcontroller.

CO 4: To write embedded C/C++ programs in different embedded systems programming platforms.

CO 5: Interfaced different input/output devices with a microcontroller.

CO 6: Design mechanical structure of a robot.

Specification of a Robot, Classification of Robots, Advantage and Disadvantages of Robots, Robot Components, Robot Sensing, Robot Degree of Freedom, Robot Joints, Robot Coordinates, Robot Reference Frames, Programming Modes, Robot Programming Language, Robot Applications Position and orientation representations, homogeneous transformations, frames, DH convention, forward kinematics, inverse kinematics Classes of tactile and non-tactile sensors, working principles, mathematical modelling of sensors, multi-sensor integration, control issues

Classes of robot actuators, working principles, mathematical modelling of actuators, mechanical construction and control issues Hardware and software architectures of robot controllers, robot

programming paradigms, robot programming languages Path types, point-to-point-motion, continuous path motion, spline interpolation

Books/References:

1. Introduction to robotics: Mechanics and Control, John J. Craig, Prentice Hall, 2004
2. Introduction to robotics. Phillip John McKerrow. Addison-Wesley Publishing Company, 1991
3. Robot Dynamics and Control. Mark W. Spong and M. Vidyasagar.John Wiley and Sons, 1996
4. Robot Motion and Control (Recent Developments) by M.Thoma& M. Morari
5. Robotics: Control, Sensing, Vision and Intelligence, K.S. Fu, R.C. Gonzalez, C.S.G. Lee, McGraw Hill Education (India Ed.)
6. Robotics and Automation Handbook, Thomas R. Kurfess, CRC Press

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

COURSE OUTCOME:

CO1: Describe basic organization of computer and the architecture of 8086 microprocessor.

CO2: Implement assembly language program for given task for 8086 microprocessor.

CO3: Demonstrate control unit operations and conceptualize instruction level parallelism.

CO4: Demonstrate and perform computer arithmetic operations on integer and real numbers.

CO5: Categorize memory organization and explain the function of each element of a memory hierarchy.

CO6: Identify and compare different methods for computer I/O mechanisms.

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**)**

COURSE OUTCOME:

CO1: Identify and develop operational research models from the verbal description of the real system.

CO2: Understand the mathematical tools that are needed to solve optimization problems.

CO3: Use mathematical software to solve the proposed models.

CO4: Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

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 – Vogelsapproximation 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, PanneerSelvan, PrenticeHall of India.
3. Operation Research, Hira and Gupta, S.Chand

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

COURSE OUTCOME:

CO1: Describe network security services and mechanisms.

CO2: Symmetrical and Asymmetrical cryptography.

CO3: Data integrity, Authentication, Digital Signatures.

CO4: Various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc.

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. AtulKahate, Cryptography and network security, TMGH

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

COURSE OUTCOME:

CO1: Apply project management concepts and techniques to an IT project.

CO2: Identify issues that could lead to IT project success or failure.

CO3: Explain project management in terms of the software development process.

CO4: Describe the responsibilities of IT project managers.

CO5: Apply project management concepts through working in a group as team leader or active team member on an IT project.

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, physicaldesign.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 ContractPlacement ; 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 ; BecomingA Team ;Decision Making ; Leadership ; Organizational Structures ; Stress ;HealthAnd 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**)**

COURSE OUTCOME:

CO1: Students will understand the techniques of modeling in the context of hierarchy of knowledge about a system and develop the capability to apply the same to study systems through available software.

CO2: Students will learn different types of simulation techniques.

CO3: Students will learn to simulate the models for the purpose of optimum control by using software.

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**)**
COURSE OUTCOME:

CO1: Understand project domain knowledge.

CO2: Analyze and Design project documentation.

CO3: Gain practical insights of testing and coding.

SIXTH SEMESTER

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

COURSE OUTCOME:

CO1: Understand specific functional areas in IT sector like development, testing, database, networking etc.

CO2: Gain practical insights of selected technology.

CO3: Experience the actual work environment in an IT organization.

CO4: Explore career opportunities in the IT sector.