

SYLLABUS

For

2 YEARS MCA PROGRAMME

(Revised Syllabus Approved by Academic Council)



*Dept. of
Computer Science and Electronics*

JUNE, 2019

UNIVERSITY OF SCIENCE & TECHNOLOGY, MEGHALAYA

Techno City, 9th Mile, Baridua, Ri-Bhoi, Meghalaya, 793101

About the Department:

In increasing importance of the Computer Application, a separate Department of Computer Science was established in USTM in the year 2012 to offer the degree Master of Computer Application (MCA). The first batch of MCA passed out in the year 2015. The courses offered are updated regularly to keep pace with the growing demands of the industry and the research community. The computers facilitate with all the latest software to meet the dynamic changes in the curriculum. The passed out students are working in various reputed industries in India.

Academic Focus:

The M.C.A program is a mix of business related computer courses. The computer related courses use microcomputers to introduce standard techniques of programming; the use of software packages including word processors, spreadsheets and databases, system analysis and design Tools. The general business courses include the functional areas of management like accounting, sales, purchase, inventory, and production. The course would emphasis the study and creation of business applications, rather than more programming Inclusion of projects in two semester improves student's technical orientation, understanding of IT environment and domain knowledge. It will build right platform for students to become successful Software professional.

Programme Details:

Master of Computer Application

Duration: 3 years (six semester)

Program Objectives:

MCA graduates who will have successful careers based on their understanding of formal and practical methods of Application Development using the concepts of computer programming, software and design principles. MCA graduates will demonstrate analytical and design skills including the ability to generate creative solutions and foster team-oriented, professionalism through effective communication in their careers. MCA graduates who will exhibit effective work ethics and be able to adapt to the challenges of a dynamic job environment.

Program Specific Outcome

PSO1. To produce knowledgeable and skilled human resources who are employable in industry, government, academic institutions, research and development, entrepreneurial pursuit and software firms

PSO2. To produce professional who will impart knowledge required for planning, designing and developing software systems and interfaces.

PSO3. To develop human skills who will achieve long-term sustainability, having decision making and good analytical capability.

PSO4: To develop professional who can compete globally and impart ethical values and professional skills towards society.

Program Structure:

Programme Structure: The MCA programme is three year degree course divided into six semesters. The programme is of 140 credits and for the award of degree a student will be required to complete the credits as per the university norm.

| | | | |
|----------|-------------|--------------|-------------|
| Part I | First Year | Semester I | Semester II |
| Part II | Second Year | Semester III | Semester IV |
| Part III | Third Year | Semester V | Semester VI |

**Syllabus of MCA, University of Science and Technology,
Meghalaya**

ACADEMIC SESSION –2018-19

Course Code: MCA

School Code: SOET

CREDIT DETAILS for MCA SYLLABUS

| Paper Code | Subject Name | Credit | Nature of course (T/P) | Marks Allotted | | |
|---------------------|--|-----------|------------------------|----------------|--------------|------------|
| | | | | Internal | End Semester | Total |
| 1st Semester | | | | | | |
| MCA101 | Introductory Programming with C (CC-1) | 4 | T | 30 | 70 | 100 |
| MCA102 | Digital Logic & Design (DLD) (CC-2) | 4 | T | 30 | 70 | 100 |
| MCA103 | Mathematical Foundation of Computer Science (MFCS) Part-I (CC-3) | 4 | T | 30 | 70 | 100 |
| MCA104 | Accounting and financial management (AFM) (CC-4) | 4 | T | 30 | 70 | 100 |
| MCA105 | Fundamental of Computer(FC) (CC-5) | 4 | T | 30 | 70 | 100 |
| MCA106 | Practical-I(C, Computer Fundamental) (CC-6) | 4 | P | 30 | 70 | 100 |
| | TOTAL | 24 | | 180 | 420 | 600 |
| 2nd Semester | | | | | | |
| MCA201 | Data structure and Algorithms (DSA) (CC-7) | 4 | T | 30 | 70 | 100 |
| MCA202 | Computer Organisation & Architecture (CO & A) (CC-8) | 4 | T | 30 | 70 | 100 |
| MCA203 | Mathematical Foundation of Computer Science (MFCS) Part-II(CC-9) | 4 | T | 30 | 70 | 100 |
| MCA204 | Object Oriented Programming with C++(CC-10) | 4 | T | 30 | 70 | 100 |
| MCA205 | Database Management Systems (DBMS)(CC-11) | 4 | T | 30 | 70 | 100 |
| MCA206 | Practical-II (C++, DBMS) (CC-12) | 4 | P | 30 | 70 | 100 |
| | TOTAL | 24 | | 180 | 420 | 600 |

| | | | | | | |
|---------------------|---|----|---|-----|-----|-----|
| 3rd Semester | | | | | | |
| MCA301 | Computer oriented numerical methods (CONM) (CC-13) | 4 | T | 30 | 70 | 100 |
| MCA302.1 | Design and Analysis of Algorithms (DAA) (DSE-1) | 4 | T | 30 | 70 | 100 |
| MCA302.2 | Microprocessor (DSE-1) | 4 | T | 30 | 70 | 100 |
| MCA303 | Operating Systems(OS) (CC-14) | 4 | T | 30 | 70 | 100 |
| MCA304 | Computer Networks(CN) (CC-15) | 4 | T | 30 | 70 | 100 |
| MCA305 | Programming with JAVA (CC-16) | 4 | T | 30 | 70 | 100 |
| MCA306 | Practical-III (Java) (CC-17) | 4 | P | 30 | 70 | 100 |
| | TOTAL | 24 | | 180 | 420 | 600 |
| 4th Semester | | | | | | |
| MCA401 | Formal Languages and Automata Theory (FLAT) (CC-18) | 4 | T | 30 | 70 | 100 |
| MCA402 | Software Engineering(SE) (CC-19) | 4 | T | 30 | 70 | 100 |
| MCA403 | .Net Technology (CC-20) | 4 | T | 30 | 70 | 100 |
| MCA404 | Web Technology (WT) (CC-21) | 4 | T | 30 | 70 | 100 |
| MCA405.1 | Computer Graphics (DSE-2) | 4 | T | 30 | 70 | 100 |
| MCA405.2 | Introduction to Machine Learning (DSE-2) | 4 | T | 30 | 70 | 100 |
| MCA406 | Practical-IV(.Net, WT) (CC-22) | 4 | P | 30 | 70 | 100 |
| | TOTAL | 24 | | 180 | 420 | 600 |

| Non-Credit Compulsory Course | | | | | | |
|------------------------------|--|-----------|---|------------|------------|------------|
| HVP740 | Human Values and Professional Ethics | - | T | 15 | 35 | 50 |
| 5th Semester | | | | | | |
| MCA501 | Cryptography and Network Security (CNS) (CC-23) | 4 | T | 30 | 70 | 100 |
| MCA502 | Management Information System(MIS) (CC-24) | 4 | T | 30 | 70 | 100 |
| MCA503.1 | Open Source Software (DSE-3) | 4 | T | 30 | 70 | 100 |
| MCA503.2 | Software Testing and Quality Assurance (DSE-3) | 4 | T | 30 | 70 | 100 |
| MCA504.1 | Pattern Recognition & Image Processing (PR&IP) (DSE-4) | 4 | T | 30 | 70 | 100 |
| MCA504.2 | Computer Based Optimization Techniques (CBOT) (DSE-4) | 4 | T | 30 | 70 | 100 |
| MCA504.3 | Wireless Networks (WN) (DSE-4) | 4 | T | 30 | 70 | 100 |
| MCA504.4 | Artificial Intelligence (AI) (DSE-4) | 4 | T | 30 | 70 | 100 |
| MCA504.5 | Data Mining & Warehousing (DWM) (DSE-4) | 4 | T | 30 | 70 | 100 |
| MCA504.6 | Distributed System (DS) (DSE-4) | 4 | T | 30 | 70 | 100 |
| MCA505 | Seminar (CC-25) | 2 | P | | 50 | 50 |
| MCA506 | Minor Project (CC-26) | 6 | P | 50 | 100 | 150 |
| MCA507 | Computer Organization(GE-1) | 4 | T | 30 | 70 | 100 |
| | TOTAL | 28 | | 210 | 490 | 700 |

| | | | | | | |
|---------------------|--|-----------|---|------------|------------|------------|
| 6th Semester | | | | | | |
| MCA601 | Major Project (Viva and Thesis Exam) (CC-27) | 20 | P | 200 | 300 | 500 |
| | TOTAL | 20 | | 200 | 300 | 500 |

MCA 1ST SEMESTER

SUBJECT NAME : Introductory Programming with C
PAPER CODE : MCA 101
PRE-REQUISITE : NIL

Course Objective:

This course aims to provide students with an understanding of the role computation can play in solving problems. It also aims to help students, regardless of their major, to feel justifiably confident of their ability to write small programs that allow them to accomplish useful goals. The course uses the C programming language.

Course Outcomes:

- CO1. To have knowledge about C language
- CO2. Have knowledge about different program structure.
- CO3. Able to apply pointer concept.
- CO4. To be able to develop logic by which it will be possible to create program/applications.
- CO5. After learning C language students can easily switch to other programming languages.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Logical Concept with Algorithm & Flowchat, Overview of C, Features of C, Structure of C Program, Compilation & Execution of C Program., Identifiers, Variables, Expression, Keywords, Data Types, Constants, Scope and Life of Variables, Operators, Precedence and Associativity of Operators, Types Conversion in Expression, Basic Input/Output And Library Functions. | 13 |
| 2 | Control Statement : Branching, Looping, Goto, Break, Continue. Arrays ,String and String standard function | 10 |
| 3 | The Need of a Function, User Defined and Library Function, Prototype of a Function, Calling of a Function, Function Argument, Call by Value, Call by Reference, Nesting of Function, Recursion. Structure and Union. | 15 |
| 4 | Pointers- The & and * Operators, Pointers Expressions, Pointers v/s Arrays, Pointer to Functions, Pointer to Structure, Static and Dynamic Memory Allocation. | 13 |
| 5 | File Management - Defining, Opening a File & Closing a File, Text File, Binary File, Functions for File Handling, Random Access to Files, Command Line Argument, pre-processor directives. | 9 |

Reading List:

Text Books:

- Balaguruswamy: Programming in C ANSI , TMGH

Reference Books:

- Kanetkar: Let us C, BPB
- Jeri, Elliot: Problem Solving and Programming Design in C, Pearson

SUBJECT NAME : Digital Logic & Design
PAPER CODE : MCA 102
PRE-REQUISITE : NIL

Course Objective:

This course covers the fundamentals of the electronic circuits that are used to build computers, and outlines the software components that support their use. Students will gain an understanding of the factors that affect the performance of hardware, and how these factors change with changes of scale, for example in the size of the data that a computer system handles. They will also gain experience in the important technique of hierarchical specification, implementation and proof of correctness using logic and data representation. Impel design of combinational and sequential circuits; standard design elements. Computer arithmetic for integers and floating-point numbers; basic error analysis. Register transfer level design of a simple microprocessor.

Course Outcomes:

- CO1. To have the basic concept of logic gates,
- CO2. Understand different number system.
- CO3. Have knowledge about basic component of combinational and sequential circuits.
- CO4. To be able to design small-scale combinational and synchronous sequential digital circuit using Boolean algebra and K-maps.
- CO5. After learning this paper students can easily understand Computer Organization & Architecture.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Number System: Binary, Octal, Hexadecimal; Positive and Negative numbers; Fixed point and Floating point quantities. Arithmetic operation: Addition, Subtraction Character codes: ASCII and EBCDIC, redundant coding for error detection and correction, Concept of parity codes, Hamming Codes and distance. | 12 |
| 2 | Logic Design: Boolean algebra, Boolean variables and function, canonical and Standard forms, Truth table, Minimization of Boolean function- Karnaugh map, tabulation methods. | 18 |
| 3 | Combinational logic circuits: AND,OR,NAND,NOR and NOT gates and tri-state buffer, Implementation of Boolean functions using logic gates; Multiplexers, Decoders, Encoders, Simple arithmetic and logic circuits. | 14 |
| 4 | Sequential Circuits: Flip-Flops, Shift Registers and Counters- Synchronous and Asynchronous. Concept of Bus and Register transfer language, State table, State diagram and State equation. | 10 |
| 5 | Basic CPU organization: Simplified functional block diagram of a CPU; Instruction execution process. | 6 |

Reading List:

Text Books:

- Mano,M.M. : Digital Logic and Computer Design, Pearson

Reference Books:

- Mano,M.M. : Computer System Architecture, Pearson
- Rajaraman V, Radhakrishnan: An introduction to Digital Computer Design, PHI
- Tocci : Digital Circuits, PE

SUBJECT NAME : Mathematical Foundation of Computer Science Part-I
PAPER CODE : MCA 103
PRE-REQUISITE : NIL

Course Objective:

Computer science is a division or subset of general computer science and mathematics which focuses on more abstract or mathematical aspects of computing and includes the theory of computation This module introduces the theory of computation through a set of abstract machines that serve as models for computation

Course Outcomes:

- CO1. To be able apply mathematical logic to solve problem.
- CO2. To have the concept of relations and sets.
- CO3. Understand functions and discrete structure.
- CO4. To be able to formulate problem and to solve recurrence problems.
- CO5. Understand different operation on matrix.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Set: Set, subset, power set, properties of set, operations on sets, products on set, representation of set in computer partitions. | 10 |
| 2 | Functions and Relation: Binary relation, types of relation, equivalence relation and equivalence class, closure of relation, function, different types of functions. | 10 |
| 3 | Logic: truth tables, algebra of propositions, logical arguments, predicate calculus/ | 9 |
| 4 | Mathematical induction: recurrence relation, permutation and combination, elementary properties. | 6 |
| 5 | Algebraic structure: Semi groups, monoid group, subgroup, normal subgroup, symmetric group, some elementary properties | 13 |
| 6 | Principle of counting: Principle of inclusion and exclusion, pigeonhole principle | 6 |
| 7 | Matrix: Addition, subtraction and multiplication, inversion and its properties | 6 |

Reading List:

Text Books:

- T Veeraranjan : Discrete Mathematics with Graph Theory and Combinatorics

Reference Books:

- Kolman: Discrete Mathematics, PHI
- Rosen: Discrete Mathematics, 6/e, TMH
- S Santha: Discrete mathematics, Cengage Learning
- Tremblay & Manohar: Discrete Mathematical Structures with application to C.Sc.,Mc. Graw Hill
- Veerarajan: Discrete Mathematics, TMGH
- Liu and Mahapatra: Discrete Mathematics, TMH

SUBJECT NAME : Accounting and financial management
 PAPER CODE : MCA 104
 PRE-REQUISITE : NIL

Course Objective:

Accountants record, classify, summaries, interpret and communicate the financial information about a business. Experienced accountants work strategically with the executive and management teams by providing expert financial advice on the impacts of management decisions, compliance and governance and the deployment of systems, resources and processes throughout the company. Through this course Students learn to apply accounting skills to a range of different managerial, business and problem solving situations.

Course Outcomes:

- CO1. To have a conceptual knowledge of basics of accounting.
- CO2. To develop a skill for recording financial transaction and to generate a financial report.
- CO3. To be familiar with accounting process and preparation of final accounts of any organization.
- CO4. To be able to handle cash book.
- CO5. Apply management accounting tools for cost allocation, budgetary control, performance evaluation, pricing and cost management.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Meaning and Importance of Financial Accounting, Development and Definition of Accounting; Golden Rule of Accounting; Book-keeping and Accounting Processes, Types of Accounts, Different Branches of Accounting; Objectives of Accounting. | 12 |
| 2 | Meaning of Accounting Transaction, Meaning of Accounting Cycle; Preparation of Journal; Preparation of Ledger Account; Relationship between journal and ledger; Compound journal entry; Opening entry; posting to Trail Balance, Subsidiary Books and its applications; meaning of Depreciation, Method of Depreciation; Posting of Depreciation. | 14 |
| 3 | Accounting concepts and Income measurement; Capital and Revenue - Classification of Income; Classification of expenditure; Classification of Receipts expired cost and Income measurement; Preparation of Final Accounts (Trading Account, Manufacturing Account, Profit & Loss Account, Income & Expenditure Account; Balance Sheet.); Concepts on Accounts of Non – Trading Institutions . | 10 |
| 4 | Meaning of Management Accounting and its Utility, Meaning of Cost Accounting and its Utility, Application of Marginal Costing Technique, Marginal Contribution, Profit Volume Ration, Break Even Point, Margin of safety; Application of Budgetary Control, different type of Budget, Advantages of the Budgetary Control; Application of Standard Costing, Variance calculation for material, Labour, and overhead. | 12 |

| | | |
|---|---|----|
| 5 | History of Computerized Accounting Software; Present Scenario of Computerized Accounting Software in India, the fundamental posting process of transactions; Computerized Invoicing methods and applications; Introduction Tally; Voucher Entry in Tally, Making Print out of the financial statements. | 12 |
|---|---|----|

Reading List:

Text Books:

- Bassu & Das : Financial Accounting
- Dr. S.P. Gupta, Management Accounting

Reference Books:

- Shukla & Grewal: Cost Accounting
- Chawla, Juneza& Saxena : Double Entry Book Keeping and Accounts
- Anole: Financial Accounting, prentice- Hall
- Jain & Narrang : Cost Accounting

SUBJECT NAME : Fundamental of Computer
 PAPER CODE : MCA 105
 PRE-REQUISITE : NIL

Course Objective:

Making the students understand and learn the basics of computer how to operate it, to make familiar with the part and function of computer, its types , how to use computer in our day to day life, its characteristics, its usage, Limitations and benefits etc. An introductory technology class is offered to teach students Microsoft Office 2013 and screen-capturing software. In addition, the course intends to familiarize students with the concepts of ethical and illegal use of online resources and to introduce them to open-source educational technologies.

Course Outcomes:

- CO1. Have knowledge about generation of computer.
- CO2. Become familiar with operating system, programming languages, peripheral devices, networking, multimedia & internet.
- CO3. Understand different components of a computer.
- CO4. Understand different language translators.
- CO5. Able to handle application software -Word, Excel and Power point.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Computer System Concept and Characteristics, Capabilities And Limitations, Generations of Computers, Personal Computer (PC), Basic Components of Computer - Control Unit, ALU, Input, Output, Memory | 10 |
| 2 | Input devices, MICR, OCR, OMR, Types of Monitor, Resolution, Refresh Rate, Dot Pitch, Video Standard – VGA, SVGA, XGA. Printers, Plotter. Storage Devices, Primary Vs Secondary, Storage Devices - Magnetic Tape, Magnetic Disks, Floppy Disks, Optical Disks, Pen Drive. | 10 |
| 3 | Types of Software, System Software - Operating System, Utility Program, Programming Languages - Machine, Assembly, High Level, 4GLs, Assemblers, Compilers and Interpreter, Application Software | 12 |
| 4 | Applications of Computer, Programming Techniques, SDLC, Algorithms, Flow Charts , Advantage & Disadvantage, Pseudo Codes, Programming , Looping Statements, Branching Statements, Decision Tree, Decision Table | 14 |
| 5 | Word Processor : Features, Text Editing, Bullets And Numbering , Formatting , Spell Checking, Thesaurus, Find And Replace, Mail –Merge , Tab & Indents , Headers, Picture Editing, Macro, Hyperlink, report generation, Template Spreadsheet : Different Features, Graphs, Cell Formatting, Formulas. Presentation . | 14 |

Reading List:

Text Books:

- Introduction to Information Technology, ITL Education Solutions, PHI

Reference Books:

- S.K.Basandra : Computers Today , Galgotia Publications.
- Alexis Leon & Mathews Leon : Fundamentals Of Information Technology , Vikas Publishing House, New Delhi.
- Ms-Office Complete Reference BPB Publication

MCA 2ND SEMESTER

SUBJECT NAME : Data structure and Algorithms
 PAPER CODE : MCA 201
 PRE-REQUISITE : MCA101

Course Objective:

This course is able to select appropriate data structures as applied to specified problem definition. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures. Students will be able to implement Linear and Non-Linear data structures. Design advance data structure using NonLinear data structure. Determine and analyze the complexity of given Algorithms

Course Outcomes:

- CO1. Use different kind of data structures which are suited for different applications.
- CO2. Understand the space and time complexity and according to the complexity can select appropriate data structure.
- CO3. Able to use efficient data structures which are keys of designing efficient algorithm.
- CO4. Understand the use of linear and non linear data structures.
- CO5. Store and retrieve data from main and secondary memory

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Fundamental Notions : Primitive and composite data types ;Concept of Big-O, small-o & Big-Ω, Θ. Data Structures : Linear List: Stacks, Queues, Arrays, Linked Lists, Circular & .Doubly Linked Lists. | 15 |
| 2 | Trees : Introduction& Properties of trees; Pedant vertices in a tree; Rooted binary trees ; Extended Binary trees; Complete Binary trees; Binary Search Trees; Insertion and Deletion of nodes in Binary Search Tree. | 10 |
| 3 | Graph: Concept of graph, vertex set, edge set, connected graph etc., Adjacency matrix, Path matrix, Warshall's algorithm, Modified Warshall's algorithm, Adjacency list, Node list, Edge list. Spanning trees . | 15 |
| 4 | File Structure: Concept of fields, Records and Files, Block, Clusters, Sectors. Sequential File Organization, Variable length Records ;Text Files: Indexing Structures like B-Tree; ISAM; | 8 |
| 5 | Sorting and Searching: Selection Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort Searching Technique: Binary Search, Linear Search | 12 |

Reading List:

Text Books:

- Aho, Hopcroft and Ullman: Data Structures and Algorithms, Addison Wesley Publishing Co.
- Horowitz and Sahni : Fundamentals of Algorithms, Narosa Publishing House .

Reference Books:

- Cormen , Leiserson , Rivest: Introduction to Algorithms, MIT Press & McGraw - Hill Books Company.
- Rauthan & Patel: Expert Data Structures, Khanna Publication Co(Ltd).
- Weiss: Data Structures and Algorithm Analysis in C++, Pearson Education

SUBJECT NAME : Computer Organisation & Architecture
 PAPER CODE : MCA 202
 PRE-REQUISITE : MCA102

Course Objective:

Computer architecture is concerned with all aspects of the design and organization of the central processing unit and the integration of the CPU into the computer system itself. Architecture extends upward into computer software because a processor's architecture must cooperate with the operating system and system software. It is impossible to design an operating system well without a knowledge of the underlying architecture.

Course Outcomes:

- CO1. Understand the theory of digital design and computer organization to provide an insight of how basic computer components are specified.
- CO2. Come to know about the functions of various hardware component and their building blocks.
- CO3. Able to understand Boolean algebraic expression to digital design.
- CO4. Able to understand the realization of different combinational/ sequential circuits.
- CO5. Acquire the knowledge of memory hierarchy and primary memory.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Overview: Simplified block diagram of a computer system, Instruction execution Model. | 10 |
| 2 | Processor Organization: Instruction set, types, formats, addressing modes; Register set; Assembly and machine language programming. Computer arithmetic: Review of addition and subtraction; Multiplication- basic, Booth's, array; Division- basic, restoring, non-restoring; Floating point arithmetic. | 14 |
| 3 | Data path organization, concept of a bus. Control structure: Hardware, Microprogramming. | 10 |
| 4 | Memory Organization: Interfacing of memory with a processor; Cache memory; Introduction to virtual memory. Input output organization: Synchronization of data transfer: strobes and handshaking, I/O mapping and control: Program controlled, Interrupt, driven, DMA, Interrupt and DMA mechanisms. | 13 |
| 5 | Microprocessors: Introduction to Intel 8085 microprocessor and its peripheral chips, addressing modes and simple programming examples, A RISC processor (e.g. Motorola 88000) to introduce the basic concepts of RISC architecture, SISD, SIMD, MISD, MIMD, .. | 13 |

Reading List:

Text Books:

- Mano M.M: Computer system Architecture, PHI (EEE)

Reference Books:

- William Stallings: Computer Organisation and architecture, Pearson
- Stallings : Computer Organization & Architecture, PE
- Hayes : Computer Architecture & Organization, MGH
- Hamacher, Vranesic and Zaky: Computer Organization, TMGH

SUBJECT NAME : Mathematical Foundation of Computer Science Part-II
 PAPER CODE : MCA 203
 PRE-REQUISITE : MCA 103

Course Objective:

This Course includes various topics in Graph Theory including a selection from graph algorithms, connectivity, networks, planarity, graph colouring, graph symmetries. An introduction to Design Theory including a selection of topics from Latin squares, Steiner triple systems, balanced incomplete block designs, graph decompositions, projective and affine designs. This course provides an elementary introduction to probability and statistics with applications. Topics include; basic probability models; combinatorics; random variables; discrete and continuous probability distributions; statistical estimation and testing.

Course Outcomes:

- CO1. Able to understand different types of graph and its practical applications.
- CO2. Able to learn different principles of discrete mathematics, algebraic structure and graph theory to solve some practical problem.
- CO3. Come to know about the thickness and crossing and represent different graph in matrix format.
- CO4. Able to understand chromatic number and colour problems.
- CO5. Apply the principles of various numerical techniques, statistics and probability to solve different problems.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Graph: Incidence and degree; Handshaking Lemma; Isomorphism; Sub graphs and Union of graphs; Connectedness: Walks ,Paths and Circuits: Components , Eulerian graph, Hamiltonian graph - necessary and sufficient conditions; Travelling salesman; Bipartite graph. Tree: Properties of trees; Pendant vertices in a tree; Centre of a tree; Rooted binary trees; Spanning trees, Fundamental circuits; Spanning trees of a weighted graph; cut-sets and cut-vertices; Fundamental cut-sets; Connectivity and separativity; network flow; max-flow min-cut theorem. | 12 |
| 2 | Planar graph: Combinational and geometric duals: Kuratowski's graph: detection of planarity: Thickness and crossings. Matrix representations of graph: Incidence; Adjacency; matrices and their properties | 10 |
| 3 | Colourings: Chromatic number: Chromatic polynomial; The six and five colour theorems; The four colour problem. | 10 |
| 4 | Directed graphs: Binary relations; Directed graphs and connectedness; directed trees; Aborecence; Polish method; Touranaments. Counting of labelled trees: Cayley's theorem; Counting methods; Polya theory. | 6 |
| 5 | Basic statistics: Measures of central tendencies- Mean, Median, Mode; Measures of dispersion:-Range variance and Standard deviation: Frequency distributions and cumulative frequency distribution and cumulative frequency, Basic concept EXCEL, SPSS. Basic concept of Probability with addition, multiplication; conditional probability; Bayes Theorem; Random variables; Probability Distribution - Binomial, Poisson, Normal | 12 |

Reading List:

Text Books:

- Harary : Graph Theory, PHI(EEE).

Reference Books:

- Agnarsson: Graph Theory ,Pearson
- Deo, N.: Graph Theory with Applications to Engineering and Computer Science
- West : Graph Theory, PHI
- Hogg,Tanis and Rao: Probability and Statistical Inference , Pearson
- Yule, U.G., Kendall, M.G: An Introduction to the Theory of statistics, Chalies Griffin and Co.Ltd

SUBJECT NAME : Object Oriented Programming with C++
 PAPER CODE : MCA 204
 PRE-REQUISITE : MCA101

Course Objective:

This course provides an introduction to software construction using an object-oriented approach. Acquire programming skills in connection with engineering science or technology. Object oriented programming (OOP) is a programming paradigm that uses "objects" and their interactions to design applications and computer programs. It is based on several techniques, including inheritance, modularity, polymorphism, and encapsulation.

Course Outcomes:

- CO1. Know the principles of OOPs concept and structure.
- CO2. Analyze the concept of classes and object, array, functions, constructor and destructor.
- CO3. Come to know the concept of inheritance and classification, pointers, virtual function and polymorphism.
- CO4. Able to work with file, file pointers and manipulators.
- CO5. Understand the concept of templates and exception handling.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Object oriented programming concepts and OOPs Features, Advantages, Data types, operators, User defined data types, Input & Output Stream, Array & String, User Defined Functions, Inline Function, Default arguments, Pointer | 13 |
| 2 | Implementation of class in C++, C++ Object, Constructor: Constructor overloading, Copy Constructor , Destructor, Scope Resolution operator, Static Class Members, Passing Objects to Function, Returning Objects, Friend Function, Friend Classes. Function & Operator Overloading, This Pointer, Operator Overloading Using Friend Function | 20 |
| 3 | Inheritance: Base Class & Derived Class, Access Control, Types of Inheritance, Constructors, Destructors used in Inheritance, Virtual Base Classes. Virtual Functions & Polymorphism: Virtual Function, Pure Virtual Functions, New & Delete operator. | 12 |
| 4 | Streams and Files: Streams classes, Stream Errors, Disk File I/O with streams, file pointers, error handling in file I/O with member function, Formatted I/O: Formatting Using The Ios Members, Flag values, command line arguments, and printer output, manipulators. Templates: Function templates, Class templates | 12 |
| 5 | Exception handling: try, throw, catch sequence, multiple catch blocks, uncaught exceptions, catch-all exception handler. | 7 |

Reading List:

Text Books:

- E Balagurusamy : Object oriented programming with C++

Reference Books:

- K. R. Venugopal : Mastering C++
- Y Kanetkar , Let us C++

SUBJECT NAME : Database Management Systems
 PAPER CODE : MCA 205
 PRE-REQUISITE : NIL

Course Objective:

This course covers advanced database management system design principles and techniques. The course materials will be drawn from both classic and recent research literature. Possible topics include access methods, query processing and optimization, transaction processing, distributed databases, object-oriented and object-relational databases.

Course Outcomes:

- CO1. To analyze the database design methodology.
- CO2. Acquire the knowledge in fundamental of database management system.
- CO3. Be able to analyze the difference between traditional file system and DBMS.
- CO4. Draw various data models for database and can write different queries.
- CO5. Be able to handle different database languages.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Introduction: Introduction To Database Systems Purpose of Database System, View Of Data, Characteristics of Database Approach, Role of Database administrators, Role of Database Designers, End Users, Advantages of Using a DBMS and When not to use a DBMS. DBMS Architecture: Data Models – Categories of data models, Schemas, Instances, and Database states. DBMS Architecture and Data Independence – The Three schema architecture, Data independence. DBMS Languages and Interfaces. Classifications of Database Management Systems. | 8 |
| 2 | Data Modeling: Using High Level Conceptual Data Models for Database Design, Entity types, Entity Sets, Attributes and Keys. Relationships, Relationship types, Roles and Structural constraints. Weak Entity Types and Drawing E- R Diagrams. Index Structures for Files: Single Level Ordered Indexes – Primary indexes, Clustering indexes and Secondary indexes. Multi-level indexes, Hashing concepts. | 12 |
| 3 | Relational Data Model Relation: Integrity constraints - domain, entity and Referential integrity constraints, Basic Relational Algebra operations, select, project and join operations. Database Design: Normalization concepts, first, second, third normal forms, Boyce-Codd normal form. Functional dependency diagram and design of relational database from at. | 12 |
| 4 | SQL,PL/SQL: SQL data definition and data types, specifying constraints in SQL, schema change statements, SQL constructs (Select ... From... Where... Group by Having... Order by.... Exists.... Not Exists), Insert, Delete, Update, View, Definition and use, nested quires, Constraints considers(NOT NULL , UNIQUE, Check , Primary key. Foreign key, Default) Introduction to PL/SQL(basic concept). (Example and case studies from ORACLE/MySQL to be discuss in the course) | 12 |
| 5 | Transaction Processing Concepts: Desirable properties of Transactions , | 14 |

| | | |
|--|---|--|
| | Schedules and Recoverability. Lock-Based Protocols – Locks, Granting of Locks, and Two phase locking protocol and implementation of locking Data Base Administration Introduction to Database security issues, views, privileges, granting privileges security specification in SQL, Database recovery concepts. Security and Integrity : Violations, authorization, views, privileges, granting privileges security specification in SQL | |
|--|---|--|

Reading List:

Text Books:

- Elmasari and Navathe: Fundamentals Of Database System, Narosa Publishing Company

Reference Books:

- Silberschats, Kroth and Sudershan: Principles of Database Systems, McGraw Hill Publication
- J.D. Ullman: Principles of Database Systems, Galgotia Publishing Private Limited
- C.J. Date: An Introduction to Database Systems, Vol-I and Vol-II, Addison-Wesley Publishing co.

MCA 3RD SEMESTER

SUBJECT NAME : Computer Oriented Numerical Methods
PAPER CODE : MCA 301
PRE-REQUISITE : MCA103

Course Objective:

Computer oriented methods for solving numerical problems in science and engineering; numerical solutions to systems of simultaneous linear equations, nonlinear algebraic equations (root solving), differentiation and integration, ordinary differential equations, interpolation, and curve fitting.

Course Outcomes:

- CO1. To provide the basic concept on Interpolation and its different types.
- CO2. Able to understand Numerical Differentiation, Methods of Interpolation (Linear and Quadratic),
- CO3. To understand the concept on General Quadrature Formula.
- CO4. To provide basic concept on Solution of Polynomial and Transcendental Equations
- CO5. Basic knowledge on Convergence Analysis for Iterative Methods.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Rounding Error, absolute and reference error, Difference Tables, Calculations of Differences, Newton's Divided Difference Interpolation, Finite Difference Operators, Gregory-Newton Forward and Backward Interpolation. | 10 |
| 2 | Interpolation – Polynomial Interpolation, Errors in Polynomial Interpolation Lagrange and Newton's Interpolation, Different orders of Interpolation | 6 |
| 3 | Numerical Differentiation, Methods of Interpolation (Linear and Quadratic), Methods of Finite Difference Operators, Use of different Interpolation Formulae, Extrapolation methods. | 13 |
| 4 | Numerical Integration, General Quadrature Formula, Trapezoidal Rule, Simpson's One-Third and Three-Eighth Rules, Weddle's Rule, Newton – Cote's Formula, Gaussian Quadrature Formula, Romberg Integration | 13 |
| 5 | Solution of Polynomial and Transcendental Equations, Simultaneous Linear Equations, Direct Methods, Gauss Elimination Method, Iteration Methods, Gauss-Jacobi Method, Gauss-Siedel Method, Convergence Analysis for Iterative Methods. | 15 |

Reading List:

Text Books:

- Jane Ayengar : Numerical Methods (New Age Publication)

Reference Books:

- Scheld: Numerical Analysis, TMGH
- Gerald and Wheatley : Applied Numerical Analysis ,Pearson
- Niyogi : Numerical Analysis and algorithm ,TMGH
- Schilling and Harris : Applied numerical methods for Engineering, Cengage
- A.R.Vasistha : Numerical Analysis (Meerut Publication)

SUBJECT NAME : Design and Analysis of Algorithms
PAPER CODE : MCA 302.1
PRE-REQUISITE : MCA201

Course Objective:

Introduction to fundamental techniques for designing and analyzing algorithms, including asymptotic analysis; divide-and-conquer algorithms and recurrences; greedy algorithms; data structures; dynamic programming; graph algorithms; and randomized algorithms.

Course Outcomes:

CO1. To understand and analyze space and time complexity of various algorithms

CO2. To implement various operations on arrays and linked list.

CO3. To understand and analyze Divide -and –Conquer, Dynamic Programming and Greedy Methods

CO4. To design tree data structure and apply it in data compression algorithms

CO5. To understand and implement sorting and searching algorithms and evaluate the Complexities of these algorithms.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Algorithms: Asymptotic Notation, Models of Computation, Space and Time Complexity, Growth of functions, Upper and Lower bounds, Recurrences | 10 |
| 2 | Paradigms: Divide -and -Conquer, Branch and Bound, Backtracking, Dynamic Programming, Greedy Methods | 14 |
| 3 | Analysis of sorting, Graph & Data Structures based Algorithms Sorting algorithms: Insertion sort, Merge sort, Heap sort, Quick sort, Linear Time sorting algorithms (Count sort, Radix sort, Bucket sort), Hashing algorithms | 15 |
| 4 | Graph Algorithms: BFS, DFS, Topological sort, Spanning trees Data Structure based Algorithms : BST, B-Trees | 13 |
| 5 | Introduction to NP-Completeness: The class P, The class NP, Polynomial reducibility NP- Completeness, NP-Completeness proofs. Examples of NP-Complete problems. | 12 |

Reading List:

Text Books:

- Aho, Hopcroft and Ullman: The Design and Analysis of Computer Algorithms, PE

Reference Books:

- Cormen, Leiserson, Rivest: Stein: Introduction to algorithms, PHI
- Dasgupta : Algorithms, TMH
- Manber, Udi: Introduction to Algorithms. 2/e Addison-Wesley,1994
- G. Brassard and P. Bratley: Fundamentals of Algorithms. Prentice Hall, 1995

PAPER NAME : Microprocessor
 PAPER CODE : MCA 302.2
 PRE-REQUISITE : NIL

Course Objective:

The objective of this course is to become familiar with the architecture and the instruction set of an Intel microprocessor. Assembly language programming will be studied as well as the design of various types of digital and analog interfaces.

Course Outcome:

- CO1. Students should be able to solve basic binary math operations using the microprocessor. Students should be able to demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor.
- CO2. Students should be able to program using the capabilities of the stack, the program counter, and the status register and show how these are used to execute a machine code program.
- CO3. Students should be able to apply knowledge of the microprocessor's internal registers and operations by use of a PC based microprocessor simulator.
- CO4. Students should be able to design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.
- CO5. Students should be able to write assembly language programs and download the machine code that will provide solutions real-world control problems such as fluid level control, temperature control, and batch processes.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Introduction to microprocessors, its evolution, use and application | 10 |
| 2 | Microprocessor Architecture: 8088 MPU, Signal description, memory organization, Instruction processing in 8085/8088 MPU, 80486-SX/DX 32 bit processors architecture, addressing modes of 80386, 80486-SX/DX 32 bit processors, data types, paging and segmentation. Introduction to Pentium Processors, its difference with 80486/80386. | 14 |
| 3 | Advanced Programming : Stack and subroutines, Data conversion, BCD arithmetic, Interrupt and Interrupt service routine, Interrupt codes of 8085/8088 | 15 |
| 4 | Peripheral and Interfacing: Basic peripherals and their interfacing with 8085/8088, Dynamic RAM interfacing, Interfacing I/O Ports, PIUO 8255 and its operation modes, Interfacing with D/A and A/D Convertors. | 13 |
| 5 | Embedded Design: Case study - I : Introduction to Microprocessor based concept, Design of a Aluminium Smelter shell: General process Description, Normal Control electrolysis cell, Cell abnormalities in an aluminium shelter, Brief description of the control laws, salient issues in Design, Result and discussion | 12 |

Reading List:

Text Books:

- Gaonkar : Microprocessor Architecture, Programming and applications with the 8085/8080A : Latest Edition, WILEY EASTERN LIMITED

Reference Books:

- Todd D.Morton : Embedded Microcontrollers, PEARSON EDUCATION
- Mazidi Mazidi : The 8051 Microcontroller & Embedded Systems, PEARSON EDUCATION

SUBJECT NAME : Operating Systems
PAPER CODE : MCA 303
PRE-REQUISITE : MCA 105

Course Objective:

This course is an introduction to the theory and practice behind modern computer operating systems. Topics will include what an operating system does (and doesn't) do, system calls and interfaces, processes, concurrent programming, resource scheduling and management (of the CPU, memory, etc.), virtual memory, deadlocks, distributed systems and algorithms, networked computing and programming, and security.

Course Outcomes:

CO1. To understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in operating system.

CO2. To classify about the communication and concurrency control among the concurrent processes in operating system.

CO3. To analyze the concept of process and its management which includes process scheduling, process synchronization, deadlock, communication.

CO4. To provide basic knowledge on how memory management is implemented by the operating system, including concepts of paging, segmentation, paged segmentation etc.

CO5. To gain insight on file management, disk management etc and to become familiar with the protection and security mechanisms taken by operating system.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Overview: Evolution, current status and future trends. Structural overview. | 5 |
| 2 | Process concepts: Process states, process control block, process scheduling algorithms Support for concurrent processes: Mutual exclusion, shared data, critical sections, busy form of waiting, lock and unlock primitives, synchronization, block and wakeup. Inter process communication issues, primitives. | 20 |
| 3 | System Deadlock: Prevention, detection and avoidance | 8 |
| 4 | Memory management: Contiguous and non-contiguous allocation, virtual memory, segmentation, paging, page scheduling and replacement algorithms. | 16 |
| 5 | File Systems: Management, protection mechanisms. I/O management, disk scheduling. Design of UNIX, LINUX- a case study. An overview of network and distributed operating systems. | 12 |

Reading List:

Text Books:

- Silberschatz A, Galvin P: Operating system concepts, 4th ed. AWP.

Reference Books:

- Milenkovic M.: Operating System- Concepts and Design, MGH Tanenbaum
- Operating System- Design and Implementation, PHI (EEE).
- Bach, M.: Design of the UNIX operating system, PHI (EEE).
- Deitel, Deitel, choffnes: Operating systems, Pearson

SUBJECT NAME : Computer Networks
 PAPER CODE : MCA 304
 PRE-REQUISITE : MCA102

Course Objective:

Basic concepts in networking, the OSI model, error detection codes, flow control. Data communications, network architectures, communication protocols, data link control, medium access control; introduction to local area networks metropolitan area networks and wide area networks; introduction to Internet and TCP/IP.

Course Outcomes:

- CO1. To be able to understand the basic concepts and principles in Networking.
- CO2. To be able to understand the concept of Wireless LANs, PAN, Mobile network.
- CO3. To understand and analyze different Network Layer Routing, Congestion and deadlock control algorithms
- CO4. To provide throughout knowledge on Network security-issues and threats
- CO5. To understand and analyze the concept of Cryptography

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Goals of networking, types, application, topologies, Standards, ISO-OSI reference model, TCP/IP reference model | 12 |
| 2 | Physical Layer Concepts of data transmission, communication media, modulation and multiplexing methods, Switching techniques. | 10 |
| 3 | Medium Access Control sub-layer – channel allocation, ALOHA, CSMA, CSMA/CD, token ring, token bus, Standard LAN/WAN, MAC Protocols. Protocols (IEEE 802.X), satellite networks. Data link layer Framing, error control techniques, data link protocols. Sliding window protocols, examples of DLL protocols. | 14 |
| 4 | Network Layer Routing, Congestion and deadlock control algorithms. Internetworking issues and devices, gateways, bridges and routers, Transport layer Connection management, TCP, UDP. | 13 |
| 5 | Data Compression method: RPC. Application layer Remote login, File transfer, Network file system. Network security-issues, threats, attacks to networks, design of security system, recent trends in network security, Data encryption and decryption. Public Key Cryptography, Symmetric Cryptography, Digital Signature, Digital Certificate | 12 |

Reading List:

Text Books:

- Tanenbaum A.S.: Computer Network, PHI (EEE).
- Forouzan : Data communication and networking, 4th Edn, TMGH

Reference Books:

- Stevens: UNIX Network Programming, PHI (EEE)
- Stalling: Data and Computer Communication, PHI (EEE).

SUBJECT NAME : Programming with JAVA
 PAPER CODE : MCA 305
 PRE-REQUISITE : MCA 204

Course Objective:

This course provides an introduction to software construction using an object-oriented approach. Acquire programming skills in connection with engineering science or technology. It is based on several techniques, including inheritance, modularity, polymorphism, and encapsulation. Many modern programming languages now support OOP. From this module, we will learn the art of the object-oriented programming using JAVA Programming Language after having a background in the procedural paradigm that was introduced in the module “Programming Fundamentals”.

Course Outcomes:

- CO1. To impart the knowledge of object oriented programming.
- CO2. To able to understand the concept of basic java language.
- CO3. To provide basic concept of Network programming using Java.
- CO4. To understand the underlying principles on GUI programming using Java.
- CO5. To provide the core concept on Applet Programming.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | History and design features of JAVA, basics of JAVA, tools in JDK. Keywords, Constants, Variables, and Data Types. Operators and Expressions, Decision making, Branching and Looping, Jump statements. Arrays and Strings. String Buffer Classes. | 10 |
| 2 | Classes, Objects and Methods Defining a class, constructors, Wrapper Classes. Inheritance, Basics types, using super, multi level hierarchy, abstract and final classes, packages and interfaces, Extending interfaces, Access protection. Input/Output Streams, Byte and Character streams, predefined streams, reading and writing from console and files .Using standard Java Packages (lang.util,io) Networking -Basics, networking classes and interfaces, using java.net package. | 14 |
| 3 | Exception Handling, built in exceptions,user defined exceptions. Multithreading, Java Thread model , Interthread communication. AWT Classes, Event Handling and Swing classes, Layout managers and menus, Handling image, animation, sound and video. Event Handling mechanism, the Delegation Event Model, Event Classes, Event Listener interfaces, Adapter and Inner Classes.Java Swing -Japplet, Icons and Labels, Text fields, Buttons, Combo Boxes, Tabbed and Scroll Panes, Trees, Tables. | 14 |
| 4 | Introduction to MySQL –features, installation & configuration, creating & managing database, MySQL Driver Java Database Connectivity (JDBC) with MySql –loading MySql driver – creating connection – Statement – ResultSet | 13 |

| | | |
|---|---|----|
| 5 | Introduction to Servlet- Servlet Life Cycle – ServletRequest & Servlet Response – Writing Servlets – Requirements & Configuration ServletRequest & ServletResponse Methods & use – sending different types of data, JSP | 13 |
|---|---|----|

Reading List:

Text Books:

- Patrick naughton and herbert schildt : Java the complete reference

Reference Books:

- Professional java server programming ,SPD publications
- Paul Perrone, Venkata S.R.Krishna,R.Chaganti: Building java enterprise systems with jee, Techmedia publications
- E. Balaguruswamy: Programming with java, TMH publications

MCA 4TH SEMESTER

SUBJECT NAME : Formal Languages and Automata Theory
 PAPER CODE : MCA 401
 PRE-REQUISITE : MCA103

Course Objective:

Theoretical computer science is a division or subset of general computer science and mathematics which focuses on more abstract or mathematical aspects of computing and includes the theory of computation. This module introduces the theory of computation through a set of abstract machines that serve as models for computation - finite automata, pushdown automata, and Turing machines – and examines the relationship between these automata and formal languages. Additional topics beyond the automata classes themselves include deterministic and nondeterministic machines, regular expressions, context free grammars.

Course Outcomes:

CO1.Design automata, regular expressions and context-free grammars accepting or generating a certain language

CO2.Transform between equivalent deterministic and non-deterministic finite automata, and regular expressions.

CO3.Prove properties of languages, grammars and automata with rigorously formal mathematical methods.

CO4.Determine if a certain word belongs to a language.

CO5.Define Turing machines performing simple tasks.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Concepts of Automata Theory: Automata, Computability and Complexity, Alphabets, Strings, Languages, Grammars | 8 |
| 2 | Finite Automata: Deterministic and non deterministic finite Automata, Equivalence of DFA & NFA, Finite Automata with Epsilon – Transitions. | 10 |
| 3 | Regular Expression (RE) and languages : Building RE, operators of RE, Conversion of RE to Automata and Automata to RE. Application of RE and its algebraic laws. | 10 |
| 4 | Context-free Grammars: Definition and Derivation of languages, Ambiguity in Grammars and languages: CHOMSKY NORMAL FORM (CNF),GREIBACH NORMAL FORM(GNF). Pushdown – Automata: Definition, The language of a PDA, Equivalence of PDA and CFG's. | 10 |
| 5 | Turing Machines: Notations, ID for Turing Machine. Variants of Turing Machines : Multitape Turing Machine, Non-Deterministic Turing Machine | 12 |

Reading List:

Text Books:

- Michal Sipser : Theory of Computation, CENCAGE Learning

Reference Books:

- Hopcroft, Motwani & Ullman: Introduction to Automata Theory, Languages and Computation 3rd Edn. LPE
- Martin : Introduction To Languages & Theory of Computation, TMH
- Buchi A.: Finite Automata, Their Algebras and Grammars: Towards a Theory of Formal Expressions, Springer

SUBJECT NAME : Software Engineering
 PAPER CODE : MCA 402
 PRE-REQUISITE : NIL

Course Objective:

To introduce the various stages of system level development and design, and the models used come up with real system SW creation. Development with reuse. Verification and validation: Test process. test planning. Testing strategies. Defect testing. Static verification. Engineering Design: Process. design strategies. Design quality. Architectural design: System structuring. Control models. Modular decomposition. Domain-specific architectures. Object oriented design, Function-oriented design, Real - time system design, User interface design.

Course Outcomes:

- CO1. To know how to develop the software project
- CO2. To learn developing methodology of software project
- CO3. Understanding tools and techniques of software engineering
- CO4. Verify and validate the problems of software programming & perform software testing
- CO5. Maintaining the quality of software project.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Overview of system analysis and design: Information systems concepts, system environment, elements of a system, system development life cycle. Software Characteristics and Applications, Layered Technology, Software Process Models, planning software project metrics | 12 |
| 2 | Software requirements engineering process: Functional and non functional requirements, user requirements, system requirements, the SRS document, requirements elicitation and analysis, system modelling & tools, DFD,DD,UML. | 15 |
| 3 | Software design: top down and bottom up approaches, structured, object based and object oriented design, modular design, architectural design, user interface design. | 10 |
| 4 | Software testing and maintenance: Concepts of software testing, type of testing, testing strategies, post implementation review and software maintenance. | 12 |
| 5 | Software project and quality management: Measures and measurements, cost estimation, cocomo model, scheduling, quality concepts, software reliability and quality standards. Software risk management (credit):Software risks, risk strategies risk identification, risk projection, risk refinement. | 14 |

Reading List:

Text Books:

- Pressman. R.S.: Software Engineering: A practitioner's Approach.

Reference Books:

- Awad.E.H.: System analysis and design
- Rajib Mall: Software Engineering.

SUBJECT NAME : .Net Technology
 PAPER CODE : MCA 403
 PRE-REQUISITE : MCA101

Course Objective:

This course will cover the practical aspects of multi-tier application development using the .NET framework. The goal of this course is to introduce the students to the basics of distributed application development. We will introduce the students to Web Service development and .NET remoting. Technologies covered include the Common Language Runtime (CLR), .NET framework classes, C#, ASP.NET, and ADO.NET. We will also cover service oriented architecture, design, performance, security, content managements systems and deployment issues encountered in building multi-tier distributed applications.

Course Outcomes:

- CO1. Understand .NET Framework and describe some of the major enhancements to the new version of C#
- CO2. Learn to create applications using Microsoft Windows Forms
- CO3. Learn to create applications with the use of ADO. NET
- CO4. Learn how to work with ASP.Net & XML Documents
- CO5. Use Crystal Reports that may help in creating reports related to the project.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Introduction, .NET Framework features & architecture, CLR, Common Type System, IDE, Console Programming, Data Types, Scope & lifetime of a variable, Control flow statements, Arrays, Subroutine, Functions. | 11 |
| 2 | Windows Forms and Controls in details: The Windows Forms Model, Creating Windows Forms, Windows Form Controls, Menus, Dialogs, Tooltips, Common dialog control | 10 |
| 3 | The Basics and Console Applications in C#: Data Types -, Exploring Assemblies and Namespaces, String Manipulation, Namespaces, Classes, Constructor and Destructors, Function Overloading & Inheritance, Operator Overloading, When to use Console Applications - Generating Console Output, Processing Console Input. Inheritance, Exploring the Base Class Library, Debugging and Error Handling, Files and I/O, Collections | 13 |
| 4 | ADO.NET: Benefits of ADO.NET, ADO.NET compared to classic ADO -, Datasets, Managed Providers -, Data Binding: Introducing Data Source Controls -, Reading and Write Data Using the SqlDataSource Control. | 12 |
| 5 | ASP.NET: Introduction to ASP.NET, Working with Web and HTML Controls, Using Rich Server Controls, Login controls, Overview of ASP.NET Validation Controls. Creating and Consuming Web Services: Creating an XML Web Service with Visual Studio, Designing XML Web Services, Creating Web Service Consumers, | 14 |

Reading List:

Text Books:

- .Net 4.5 Programming 6 In 1, Black Book- Dreamtech
- Damini Grover: Dot Net Technology, IK International Publishing House Pvt. Ltd

Reference Books:

- Steven Holzner : Vb.Net Programming Black Book, Dreamtech Publications
- Evangelos Petroustos : Mastering Vb.Net, BPB Publications
- Introduction To .Net Framework-Worx Publication

SUBJECT NAME : Web Technology
 PAPER CODE : MCA 404
 PRE-REQUISITE : MCA303

Course Objective:

Quick review of the Internet and Internet programming concepts, Web Servers and Web Application Servers, Design Methodologies with concentration on Object-Oriented concepts, Client-Side Programming, Server-Side Programming, Active Server Pages, Database Connectivity to web applications, Adding Dynamic content to web applications.

Course Outcomes:

1. Understand the various protocols used for Web Technology
2. Understand the various steps in designing Creative and dynamic website
3. Write HTML, JavaScript, CSS & DTD
4. Understand PHP, working with files, forms & Database.
5. Understand Web Security & Services.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Introduction to Internet Technology: Overview of Networking protocols and TCP/IP Protocol Stack. Internet Protocols, Architecture and Background: IP Addressing & Datagrams, TCP, UDP, Ports & Sockets, TCP Connection & properties, TCP Segment format, Active & Passive Open Connections. DNS, DNS Server, Email Architecture, SMTP, POP & IMAP. WWW, web server & web browser, HTTP commands & interaction, HTTP 1.0/1.1/2.0. Architecture of Web Applications: 2-tier and 3-tier architectures | 10 |
| 2 | Web Development Technologies: Client Side Programming: Different client-side scripting: HTML, CSS, XML, DTD, JavaScript. Server Side Programming: CGI, Servlets, JSP, ASP, PHP Web Servers: IIS, Apache; Frameworks: Ajax (client-side), RIA (server-side) Types of web pages, ActiveX Controls; Database connectivity: ODBC & JDBC (overview). | 10 |
| 3 | Embedding PHP in HTML, Passing Information between Pages, PHP \$_GET, PHP \$_POST, PHP Conditional Statements, PHP Looping Statements, Break, Continue, Exit, PHP Functions: Built-in and User Defined Function, Regular Expression Functions, PHP Arrays: Creating Array and Accessing Array Elements. Working with Files, Working with Forms. Working with Database: PHP-Supported Databases; Using PHP & My SQL: Connecting to Database, Selecting a Database, Adding Table and Altering Table in a Database, Inserting, Deleting and Modifying Data in a Table, Retrieving Data, Performing Queries, Processing Result Sets. | 12 |
| 4 | Web Security Overview: Confidentiality, authentication, Integrity, Non-repudiation, Access Control, and Availability. Overview of Sniffing, spoofing, phishing, pharming. Web Security: Network Security: Digital Certificates, SSL, Firewalls, IP Security, VPN. | 10 |

| | | |
|---|--|----|
| 5 | Web Services: Concept, SOA, SOAP, UDDI, WSDL. DCOM & CORBA: basic interface, Architecture; Overview of ORB, IDL, IIOP, RMI. Wireless Internet: Mobile IP, addressing and its work. WAP: Architecture & Gateway. | 10 |
|---|--|----|

Reading List:

Text Books:

- Gottfried Vossen, Stephan Hagemann- Unleashing Web 2.0, Morgan Kaufmann Publication
- Achyut S Godbole, Atul Kahate: Web Technologies – TCP/IP to Internet Architectures, Tata McGraw Hill

Reference Books:

- Deitel & Deitel: Web Technology, Pearson Education
- Raj Kamal: Internet and Web Technologies, Tata McGraw Hill

PAPER NAME : Computer Graphics
 PAPER CODE : MCA 405.1
 PRE-REQUISITE : MCA 201

Course Objective:

The basic principles and practices of interactive computer graphics and multimedia systems are covered in this introductory course. The design and implementation of state-of-the-art computer graphic rendering and visual multimedia systems are the main part of the course. The sub-topics of the course deal with specific input/output hardware devices and their technology, software and hardware standards, programming methods for implementing 3-dimensional graphical applications and interactive multimedia applications, and a study and evaluation of the effectiveness of graphic/multimedia communications. A large component of the class is the building of a large-scale application.

Course Outcomes:

- CO1. Understand the real graphics programming
- CO2. Understand the API OpenGL
- CO3. Understand the mathematics basics, mainly linear algebra and implemented by OpenGL and programming language like C
- CO4. Recognize a number of problems and topics drawn from computer graphics, and explores them through the lens of dynamic geometry software
- CO5. Understand the 2D and 3D computer graphics.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Display Devices: Line and point plotting Systems; Raster, vector, pixel and point plotters, Continual refresh and storage displays, Digital frame buffer , Plasma panel displays, Very high resolution devices , High speed drawing , Display processors , Character generators , Color-display techniques, Pointing and positioning devices (cursor, light pen, digitizing tablet, the mouse track balls, Elastic lines , Inking , zooming , panning, scissoring, windowing ,censoring) | 15 |
| 2 | Display Description : Screen co - ordinates , user co - ordinates ; Graphical data structures (compressed incremental list, vector list, use of homogeneous co-ordinates) ; Display code generation ; Graphical functions ; | 15 |
| 3 | 2D Geometric Transformation & Viewing: Basic 2D transformation, Homogeneous co-ordinates, Composite transformation, other transformation; viewing coordinate reference frame, window-to-viewport transformation, Clipping- point, line, polygon. | 10 |
| 4 | Graphic Language Primitives constants , actions , operators 3 -D Graphics: Wire - frame perspective display, Perspective depth, Projective transformations Hidden line and surface elimination, Transparent solids Shadowing. | 12 |
| 5 | Concept of Image Processing: Techniques and applications. Animation: conventional and computer assisted animation, Animation languages, Methods of controlling animation, Basic rules of animation, Probability peculiar to animation. | 10 |

Reading List:

Text Books:

- Hearn I D .and Baker P.M.: Computer Graphics ,PHI
- John F. Hughes, Andries van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley: Computer Graphics: Principles and Practice; Addison-Wesley Professional

Reference Books:

- Newman W.Sproule, R.F.: Principles of Interactive computer graphics , McGraw Hill

PAPER NAME : Introduction to Machine Learning
PAPER CODE : MCA 405.2
PRE-REQUISITE : NIL

Course Objective:

To introduce students to the basic concepts and techniques of Machine Learning. To develop skills of using recent machine learning software for solving practical problems. To gain experience of doing independent study and research.

Course Outcomes:

- CO1. Develop an appreciation for what is involved in learning from data
- CO2. Understand a wide variety of learning algorithms
- CO3. Understand how to apply a variety of learning algorithms to data
- CO4. Understand how to perform evaluation of learning algorithms and model selection
- CO5. To provide students with an in-depth introduction to the areas of Machine Learning mainly the Algorithms, Credibility & Implementations.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Introduction to machine learning, Data mining, examples, fielded application – use of learning in performance situations, Machine learning and statistics, Data mining and ethics | 10 |
| 2 | Input: concepts, instances, and attributes, preparing the input; Output: knowledge representation- decision tables, decision trees, classification rules, association rules, rules with exceptions, rules involving relations, instance-based representation, clusters | 12 |
| 3 | Algorithms: The basic methods – inferring rudimentary rules, statistical modelling, divide-and-conquer: constructing decision trees, covering algorithm: constructing rules, mining association rules, linear models, instance-based learning, clustering. | 12 |
| 4 | Credibility: Evaluating what’s been learned – training and testing, predicting performance, cross-validation, comparing data mining methods, predicting probabilities, counting the cost, evaluating numeric prediction. | 8 |
| 5 | Implementations: Real Machine Learning Schemes- decision trees, classification rules, extending linear models, instance-based learning, numeric prediction, clustering, Bayesian networks | 12 |

Reading List:

Text Books:

- Ian H. Witten & Eibe Frank: Data Mining Practical Machine Learning Tools and Techniques, Second Edition

Reference Books:

- Tom M. Mitchel : Machine Learning
- Bishop, C.: Pattern Recognition and Machine Learning

Subject Name: Human Values and Professional Ethics

Paper Code: HVP 740

COURSE OBJECTIVES:

The purpose of this course is to examine various ethical issues that may arise in one's professional life, and how such a life intersects one's personal life and self-understanding with the core focus to enlighten the students regarding value based approaches within a variety of context. The concept of value is understood in two different contexts; one is People's judgments about what is important or meaningful in their lives and the other is principles or standards for behavior, supported by religion, constitution and norms.

COURSE OUTCOMES:

- CO1.** To critically understand ethical issues as they pertain to professional and personal identity.
- CO2.** To learn to consider oneself and the world around from these basic ethical positions.
- CO3.** To develop sharpened analytic powers and capacities for oral and written expression.

| UNIT | CONTENT | HOURS |
|-------------|---|--------------|
| 1 | Ethics and Human Values :Definition, Importance and Relevance in present-day Society. Indian Constitutional Values: Fundamental Rights and Duties; Freedom, Equality, Fraternity, Justice; Directive Principles of State Policy. Religious and Cultural Values: Values embedded in different religions; Religious Tolerance. | 8 |
| 2 | Basic Human Virtues: Concept of Honesty, Punctuality, Responsibility, Courtesy, Discipline, Courage, Compassion, Empathy and Restrain Family responsibilities: Duties as a Member of the Society, Guidance to youngsters; Gender Equality. Social Concerns: Evils of Dowry & Caste System, Racial Discrimination, Suicidal Tendencies, Substance Abuse and Addiction | 8 |
| 3 | Introduction to Professional Ethics: Need, Importance and Goals; Ethical Values in Different Professions: Dignity of Labour, Respect for Authority, Code of Conduct, Conflicts of Interest. Occupational Crime; Sexual and Mental Harassment in work place. Professional Rights: Employee Rights, Intellectual Property Rights (IPR). | 8 |
| 4 | Ethics in Professional and Global Space : Cyber Ethics and Etiquette. Correct and Judicious use of Mobile Phones/electronic gadgets, Social Networking in professional space. Environmental Ethics; Ethics in Research. | 8 |

Reading List:

Text Books:

- Jayashree Suresh and B S Raghavan- *Human Values and Professional Ethics: Values and Ethics of Profession*. S Chand, 2005.

Reference Books:

- Martin, Clancy, Wayne Vaught, and Robert Solomon (eds.)- *Ethics Across the Professions: A Reader for Professional Ethics*. Oxford: Oxford University Press, 2010.
- R.R. Gaur, R. Sangal and G.P. Bagaria- *A Foundation Course in Human Values and Professional Ethics* (Paperback). Excel Books, 2010
- Terrence M. Kelly- *Professional Ethics: A Trust-Based Approach*. Lexington Books, 2018.
- R. S. Naagarazan- *Professional Ethics and Human Values*. New Age International (Second ed.), 2019.

MCA 5TH SEMESTER

PAPER NAME : Cryptography and Network Security
PAPER CODE : MCA 501
PRE-REQUISITE : MCA203

Course Objective:

This Course focuses towards the introduction of network security using various cryptographic algorithms. Underlying network security applications. It also focuses on the practical applications that have been implemented and are in use to provide email and web security.

Course Outcomes:

- CO1. To provide basic knowledge about different methods of conventional encryption
- CO2. To provide knowledge about public and private key security, concept of keys and number theory
- CO3. To learn about authentication functions, hash functions, message authentications, modes and different h algorithms
- CO4. To provide knowledge about network security tools.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Conventional Cryptography : Definitions, Classical Cryptography, Galois Field, Unicity Distance, Entropy, Perfect Secrecy DES, AES and others symmetric cryptography | 15 |
| 2 | Asymmetric Cryptography: Number Theory, public key cryptography, RSA and Elliptic Curve Cryptography, Key management using symmetric and asymmetric key | 15 |
| 3 | Authentication: Message authentications and hash functions, hash algorithms, Digital Signatures and Authentication Protocols. | 10 |
| 4 | Operating System security : Computer systems overview, Buffer overflow, Securing UNIX | 11 |
| 5 | Network and System Security: Vulnerability, Monitoring/Sniffing, Spoofing b. Firewalls, Intrusion Detection PGP, Kerberos ,IPSec, SSL | 10 |

Reading List:

Text Books:

- W Stallings: Cryptography and Network Security: Principles and Practice, 4/e, Prentice Hall, 2006.

Reference Books:

- A. Menezes, P. van Oorshot and S. Vanstone : Handbook of Applied Cryptography, CRC Press, 1997
- B. Schneier : Applied Cryptography, 2nd Ed, John Wiley & Sons, Inc., 1996.
- C. Kauffman, R. Perham and M. Speciner: Network Security: Private Communication in a Public World, Prentice-Hall, 1994
- H. C. A. van Tilborg : Fundamentals of Cryptology, Kluwer Academic Publishers, 2000.

PAPER NAME : Management Information System
 PAPER CODE : MCA 502
 PRE-REQUISITE : NIL

Course Objective:

This course examines the role of information technology, and its management, in supporting an organization's (internally- and externally-focused) operations and strategies. Particular attention is given to issues associated with the funding and building of business and technology architectures to enable efficient, effective, and adaptable operational, tactical and strategic actions.

Course Outcomes:

- CO1. To understand the managerial level management in organizations
- CO2. To learn about different management tools, level of decision making
- CO3. Coordination with DSS.
- CO4. To develop team management skills.
- CO5. Describe how technology facilitates and enhances both operational and strategic decision making in an organization.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Management Information System (MIS): Organization and Information Systems, Changing Environment and its impact on Business - The IT/IS and its influence. The Organization: Structure, Managers and activities - Data, information and its attributes - The level of people and their information needs - Types of Decisions and information - Information System, categorization of information on the basis of nature and characteristics. | 12 |
| 2 | kinds of Information Systems: Transaction Processing System (TPS) – Office Automation System (OAS) - Management Information System (MIS) - Decision Support System (DSS) and Group Decision Support System (GDSS) - Expert System (ES) - Executive Support System | 10 |
| 3 | Enterprise System : Enterprise Resources Planning (ERP): Features, selection criteria, merits, issues and challenges in Implementation - Supply Chain Management (SCM): Features, Modules in SCM - Customer Relationship Management (CRM): Phases. Knowledge Management and e-governance. Nature of IT decision - Strategic decision - Configuration design and evaluation Information technology implementation plan. | 12 |
| 4 | Management Issues in MIS: 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. Manufacturing & Service System: Information systems for accounting, Finance, Production and Manufacturing, Marketing and HRM functions - IS in hospital, hotel, bank. | 15 |
| 5 | Security and Ethical Challenges : Ethical responsibilities of business Professionals – Business, technology. Computer crime – Hacking, cyber theft, unauthorized use at work. Piracy – software and intellectual property. Privacy Issues and the Internet Privacy. Challenges – working condition, individuals. Health and Social Issues, Ergonomics and cyber terrorism. | 12 |

Reading List:

Text Books:

- S Paul : Management Information System
- Robert D. Cuze : Management Information System

Reference Books:

- James A. O' Brien : Introduction to Information System, Tata McGraw Hill, 12th Edition.
- S.Sadagopan: Management Information Systems, PHI, 1/e, 2005
- Lynda M AppleGate, Robert D Austin et al : Corporate Information Strategy and Management, Tata McGraw Hill, 7th Edition
- Effy Oz : Management Information Systems, Thomson Course Technology, 3/e, 2003

PAPER NAME : Open Source Software
PAPER CODE : MCA 503.1
PRE-REQUISITE : NIL

Course Objective:

To provide a basic idea of Open source technology, their software development process so as to understand the role and future of open source software in the industry along with the impact of legal, economic and social issues for such software.

Course Outcomes:

- CO1. To learn the concept of open source software.
- CO2. To develop system development skills.
- CO3. To providing concept of Python programming.
- CO4. To learn programming technique with Python.
- CO5. Comparison with Python and other OSS.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Basic python Programming : Features of python, history, python constant, python strings, variables and identifiers, data types, operators and expressions | 12 |
| 2 | Decission Control Statement : Selection / conditional branching, if, if-else, if-elif statement, loops in python | 10 |
| 3 | Funcions : function definition, function call, variable scope and lifetime, return statement, arguments of python | 12 |
| 4 | Modules : name of modules, making own modules, python modules, ,odules and namespaces, standard library modules. | 15 |
| 5 | Latex : Introduction to Latex, Creating Title, Sections, Labelling, Font Effects, Coloured Text, Font Size, Lists, Comments & Spacing, Tables, Figures, Mathematical equations, Inserting references. | 12 |

Reading List:

Text Books:

- John M Zelle : Python Programming: An Introduction to Computer Science
- D.F.Griffiths, D. J. Higham : Larning LATEX

Reference Books:

- Mark Lutz : Programming Python: Powerful Object Oriented Programming
- Bruce Rogers : Python Programming
- Joseph Joyner : Python Programming for Beginners
- George Gratzer : First Steps in LATEX
- F Mittelbach and M. Goossen : The LATEX Companion

PAPER NAME : Software Testing and Quality Assurance
 PAPER CODE : MCA 503.2
 PRE-REQUISITE : NIL

Course Objective:

To formally introduce leadership and management skills and techniques to enable the student to overcome challenges associated with software projects and to successfully lead such projects and programs in today's complex systems environment.

Course Outcomes:

- CO1. Deliver successful software projects that support organization's strategic goals.
- CO2. Match organizational needs to the most effective software development model
- CO3. Plan and manage projects at each stage of the software development life cycle (SDLC)
- CO4. Create project plans that address real-world management challenges
- CO5. Develop the skills for tracking and controlling software deliverables

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Introduction: Software Quality, Role of testing, v & v, objectives and issues of testing, Testing activities and levels, Sources of Information for Test Case Selection, White-Box and Black-Box Testing , Test Planning and Design, Monitoring and Measuring Test Execution, Test Tools and Automation, Test Team Organization and Management. Unit Testing: Concept, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging. | 12 |
| 2 | Control Flow & Data Flow Testing: Outline of CFT, CF Graph, Paths in a Control Flow Graph, Path Selection Criteria, Generating Test Input, Examples of Test Data Selection. Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Testing Criteria, Comparison of Testing Techniques. | 10 |
| 3 | System Integration Testing & Test Design: Concept of Integration Testing, Different Types of Interfaces and Interface Errors, Granularity of System Integration Testing, System Integration Techniques, Test Plan for System Integration, Off-the-Shelf Component Testing, System Test Categories. | 12 |
| 4 | System Test Planning, Automation & Execution: Structure of a System Test Plan, Test Approach, Test Suite Structure, Test Environment, Test Execution Strategy, Test Effort Estimation, Scheduling and Test Milestones, System Test Automation, Selection of Test Automation Tools, Test Selection Guidelines for Automation, Structure of an Automated Test Case, Test Automation Infrastructure Metrics for Tracking System Test, Metrics for Monitoring Test Execution, Beta Testing, System Test Report, Measuring Test Effectiveness. Acceptance Testing: | 15 |

| | | |
|---|---|----|
| 5 | Software Quality: Five Views of Software Quality, McCall's Quality Factors and Criteria, Quality Factors Quality Criteria, Relationship between Quality Factors and Criteria, Quality Metrics, ISO 9126 Quality Characteristics, ISO 9000:2000 Software Quality Standard ISO 9000:2000 Fundamentals, ISO 9001:2000 Requirements | 12 |
|---|---|----|

Reading List:

Text Books:

- Pankaj Jalote : Software Project Management in Practice

Reference Books:

- Dwayne Phillips : The Software Project Manager's Handbook: Principles that Work at Work

PAPER NAME : Pattern Recognition & Image Processing
PAPER CODE : MCA 504.1
PRE-REQUISITE : NIL

Course Objective:

This course emphasizes general principles of image processing. Topics such as image enhancement, image restoration, image segmentation and image compression are covered. Some concepts of pattern recognition are also introduced in this course.

Course Outcomes:

- CO1. Students can learn the concept of image processing, image recognitions, quantization etc.
- CO2. To provide the knowledge of digitization
- CO3. To learn security aspect and how pattern reorganizations are used in security
- CO4. To provide the knowledge of Fourier transform, Laplace transform and domain conversion.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Image digital representation. Elements of visual perception. Sampling and quantisation. Image processing system elements. | 10 |
| 2 | Fourier transforms. Extension to 2· D, OCR, Walsh, Hadamard transforms | 10 |
| 3 | Enhancement and segmentation: Histogram modification. Smoothing, sharpening. Thresholding Edge detection. Segmentation. Point and region dependent techniques. | 10 |
| 4 | Image encoding: Fidelity criteria. Transform compression. KL, Fourier, DCT. Spatial compression, Run length coding. Huffman and contour coding. | 10 |
| 5 | Restoration: Models. Inverse filtering. Least squares filtering. Recursive filtering. | 10 |

Reading List:

Text Books:

- Rajjan Shinghal : Pattern Recognition: Techniques and Applications

Reference Books:

- Gonslaez, et.al : Digital Image Processing, Addison Wesley, Reading, M.A., 1990.
- Gerhard Rigoll : Pattern Recognition

PAPER NAME : Computer Based Optimisation Techniques
 PAPER CODE : MCA 504.2
 PRE-REQUISITE : NIL

Course Objective:

Solution of the global optimization problems based on a given fitness function. The optimization technique exploits genetic algorithms and is widely applicable to industrial and scientific tasks which include the effective use of neural network applications and complex computational packages in the distributed computer environment. Design and security of computer networks; pattern recognition; optimization of the oil and gas infrastructure; manufacturing electronic devices.

Course Outcomes:

- CO1. To provide the basic concept of computer simulation and optimization
- CO2. Application of maximizing benefit/minimizing product costs in various manufacturing and construction processes
- CO3. To understand and apply queuing theory, replacement theory, inventory theory etc. in business applications
- CO4. To learn Critical path and network analysis using PERT.
- CO5. To learn how to calculate and solve sequencing problem through machines.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Linear Programming: Mathematical model, assumptions of linear programming, Principles of simplex method, Revised simplex method, Applications, Duality, Dual Simplex method, sensitivity analysis | 12 |
| 2 | Special type of linear programming problems: Transportation and assignment problems. | 10 |
| 3 | Integer programming: introduction, Branch and bound techniques, Assignment and travelling salesman problems with algorithmic approach. | 10 |
| 4 | Dynamic programming: deterministic and probabilistic dynamic programming | 10 |
| 5 | Queueing model: Specification and measure of queueing systems, Structures of basic queueing system- Definition and classification of stochastic processes, Characteristics of a Queueing system, Interpretation of a model, Single Channel waiting line- (M/M/1) (∞ : FIFO), Single channel finite population queue (M/M/1): (C/FIFO), Multichannel Queueing problem (Infinite population) (M/M/C): (∞ : FIFO), Earlang Distribution (M/Ek/1): (∞ : FIFO). | 10 |

Reading List:

Text Books:

- Natarajan, Balasubramani, Tamilsari : Operations Research , Pearson.

Reference Books:

- Srinath, L.S: Linear programming, East-west, New Delhi.
- Hiller, F.S. and Liberman, G.J.: Introduction to Operations Research, Holden Day In
- Gillett, B.G.: Introduction to operations research - A Computer oriented Algorithmic approach, McGraw-Hill
- Taha: Operations Research , Pearson

PAPER NAME : Wireless Networks
PAPER CODE : MCA 504.3
PRE-REQUISITE : NIL

Course Objective:

This course is introduced to understand fundamentals of wireless communications. Analyze security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks. Demonstrate basic skills for cellular networks design. Apply knowledge of TCP/IP extensions for mobile and wireless networking.

Course Outcomes:

- CO1. To provide the concept of wireless vs. Wired communication
- CO2. To learn about mobile communication technology
- CO3. To learn different multiplexing techniques, coding techniques
- CO4. To understanding the Interface of a mobile computing system to hardware and networks
- CO5. To design applications on a mobile computing system interacting with servers and database systems

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | WIRELESS COMMUNICATION: Cellular systems- Frequency Management and Channel Assignment- types of handoff and their characteristics, dropped call rates& their evaluation - MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks, WebDM,4G, 5G Technologies. | 13 |
| 2 | WIRELESS LAN: IEEE 802.11 Standards – Architecture – Services – Mobile Ad hoc Networks- WiFi and WiMAX - Wireless Local Loop, ZigBee, RFID | 12 |
| 3 | MOBILE COMMUNICATION SYSTEMS: GSM-architecture- Location tracking and call setup- Mobility management- Handover- Security-GSM SMS –International roaming for GSM- call recording functions-subscriber and service data mgt –Mobile Number portability - VoIP service for Mobile Networks – GPRS –Architecture-GPRS procedures-attach and detach procedures-PDP context procedure-combined RA/LA update procedures-Billing,UMTS. | 14 |
| 4 | MOBILE NETWORK AND TRANSPORT LAYERS: Mobile IP – Dynamic Host Configuration Protocol-Mobile Ad Hoc Routing Protocols– Multicast routing-TCP over Wireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery – Transmission/Timeout Freezing-Selective Retransmission – Transaction Oriented TCP- TCP over 2.5 / 3G wireless Networks | 14 |
| 5 | APPLICATION LAYER: WAP Model- Mobile Location based services -WAP Gateway –WAP protocols – WAP user agent profile- caching model-wireless bearers for WAP - WML – WMLScripts – WTA - iMode-SyncML | 12 |

Reading List:

Text Books:

- Jochen Schiller : Mobile Communications, Second Edition, Pearson Education, 2003.

Reference Books:

- William Stallings : Wireless Communications and Networks, Pearson Education, 2002.
- Kaveh Pahlavan, Prasanth Krishnamoorthy : Principles of Wireless Networks, First Edition, Pearson Education, 2003.
- Uwe Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober: Principles of Mobile Computing, Springer, 2003.
- C.K.Toh : AdHoc Mobile Wireless Networks, First Edition, Pearson Education, 2002.

PAPER NAME : Artificial Intelligence
 PAPER CODE : MCA 504.4
 PRE-REQUISITE : NIL

Course Objective:

This course will introduce the basic principles in artificial intelligence research. It will cover simple representation schemes, problem solving paradigms, constraint propagation, and search strategies. Areas of application such as knowledge representation, natural language processing, expert systems, vision and robotics will be explored. The LISP programming language will also be introduced.

Course Outcomes:

- CO1. To understand basic concepts of Artificial intelligence, developments in this field, basic knowledge representation techniques, problem solving, and learning methods of Artificial Intelligence
- CO2. To learn the applicability, strengths, and weaknesses of the basic knowledge representation
- CO3. Learn about problem different type of searching algorithm
- CO4. To learn knowledge about Rule based system and Expert system
- CO5. To understand Natural language processing, modern developments in the field of AI , Soft Computing, Image processing, Robotics ,Lisp and Prolog etc.

| UNIT | CONTENT | HOURS |
|------|--|-------|
| 1 | Introduction to the object and goal of artificial intelligence: Aim and scope of the artificial intelligence, problem space and problem characteristics, state space representation | 10 |
| 2 | Problem solving techniques: Generate and test, hill climbing , search problem reduction techniques, constraint propagation, means-end-analysis, heuristics search techniques and heuristic problem solving Game playing: And or graph search, game trees and associated techniques, minimax and alpha beta pruning. Some case studies | 13 |
| 3 | Knowledge representation and inferencing : Procedural and deductive approaches production system formalism, predicate logic (first order and second order), Rule based system, schematics net conceptual dependencies, conceptual path, frames, scripts associated inferencing mechanism. Resolution in predicate logic, unification , natural deduction theorem proving, forward and backward deduction. Different techniques for reasoning under uncertainty, monotics and non monotonic reasoning. Constraint satisfaction problem. | 15 |
| 4 | Rule based system and expert system: Domain exploration, meta language ,expertise, transfer self explaining system case studies(dendral, mycin) | 12 |
| 5 | Introduction to neural network: Defination and representation of artificial neuron and its analogy with biological neuron, basic concepts of three layer neural-net and learning by back propagation, CNN and Deep learning. Basic syntax and semantics of lips and prolog. Programming exercise from ai in lips. | 13 |

Reading List:

Text Books:

- Patrick, Henry, Winston : Artificial Intelligence, Pearson Education
- Rich and Knight : Artificial Intelligence

Reference Books:

- Charniak, Mc Dermott : Introduction to Artificial Intelligence, Pearson Education
- Nilson : Artificial Intelligence

PAPER NAME : Data Mining and Warehousing
 PAPER CODE : MCA 504.5
 PRE-REQUISITE : MCA405.2

Course Objective:

Data Mining studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data. It is currently regarded as the key element of a more general process called Knowledge Discovery that deals with extracting useful knowledge from raw data. The knowledge discovery process includes data selection, cleaning, coding, using different statistical, pattern recognition and machine learning techniques, and reporting and visualization of the generated structures. The course will cover all these issues and will illustrate the whole process by examples of practical applications.

Course Outcomes:

- CO1. To understand the concept of data warehousing and its related technologies
- CO2. Learn about data warehouse architecture, data mining
- CO3. Comparison of RDBMS, OLPA, MOLAP, OLTP etc
- CO4. To know about the techniques of clustering, classification, association used real world data
- CO5. To provide a comprehensive knowledge of different data mining algorithms.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Basic Concepts: Characteristics of Data Warehouse, DSS, Differences between Data Warehouse and Database Systems, Data Warehouse architecture and its components, Metadata, Data mart, Warehouse versus Data Mining (OLTP & OLAP), OLAP tools, Data Cubes, Multidimensional Data. | 13 |
| 2 | Basic Concepts: Data Mining, Kinds of data that can be mined, Data Mining versus Database Systems, KDD, Data Preparation, Cleaning and Visualization Data Mining Techniques: Association Rule: What is an association rule? Mining association rules, Frequent sets and Border sets, Algorithms for mining association rules- Apriori Algorithm, Pincer-Search Algorithm, Border Algorithm, FP-Tree Growth Algorithm, generalized association rule, association rule with item constraints | 15 |
| 3 | Clustering: Hierarchical versus Partitional clustering, Types of data in clustering, Partitional Algorithms- K-means, K-medoids, PAM, CLARA, CLARANS. Density based clustering algorithm- DBSCAN. Hierarchical Algorithms- BIRCH, CURE. Categorical clustering Algorithms- ROCK, CACTUS | 13 |
| 4 | Decision Trees: Introduction, Tree construction principle, Decision tree generation algorithm- CART, ID3, C4.5 | 10 |
| 5 | Other Techniques for Data Mining: Concepts of Genetic Algorithms, Artificial Neural Network, Rough Sets and their application in the domain of Data Mining. Introduction to Web Mining, Text Mining and | 13 |

| | | |
|--|--|--|
| | Temporal Data Mining Issues and challenges in Data mining, Data mining application areas (example with practical case studies) | |
|--|--|--|

Reading List:

Text Books:

- Arun K. Pujari : Data Mining Techniques, (University Press)

Reference Books:

- Han and Kamber : Data Mining Concepts and Techniques
- Peter Adriaans : Data Mining, Dolf Zantinge
- K. Jain and R. C. Dukes : Algorithms for Clustering Data
- Barry Devlin : Data Warehouse, from Architecture to Implementation
- Sam Anahory, Dennis Murray : Data Warehousing in the Real World.

PAPER NAME : Distributed System
PAPER CODE : MCA 504.6
PRE-REQUISITE : MCA203, MCA303

Course Objective:

Differentiate between different types of faults and fault handling techniques in order to implement fault tolerant systems. Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design and performance constraints.

Course Outcomes:

CO1. To provide the concept of distributed system and the distinction with traditional database system

CO2. To review the limitation of DBMS and needs of distributed system

CO3. To learn interprocess communication techniques and knowledge of segmentation

CO4. To understand various distributed algorithms, such as logical clocks and leader election

CO5. To acquire knowledge about the application of distributed system in organizations specially in banking and telecommunications

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Introduction : Introduction to Distributed systems-examples of distributed systems, challenges- architectural models- fundamental models - Introduction to interprocess communications-external data representation and marshalling- client server communication-group communication – Case study: IPC in UNIX | 10 |
| 2 | Distributed Object And File System: Introduction - Communication between distributed objects - Remote procedure call - Events and notifications - Java RMI case Study - Introduction to DFS - File service architecture - Sun network file system - Introduction to Name Services- Name services and DNS - Directory and directory services | 10 |
| 3 | Distributed Operating System Support: The operating system layer – Protection – Process and threads - Communication and invocation - Operating system architecture - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical clocks - Global states - Distributed debugging – Distributed mutual exclusion. | 14 |
| 4 | Transaction And Concurrency Control – Distributed Transactions : Transactions– Nested transaction – Locks - Optimistic concurrency control - Timestamp ordering - Comparison of methods for concurrency control - Introduction to distributed transactions - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions – Distributed deadlocks - Transaction recovery | 12 |
| 5 | Security And Replication : Overview of security techniques - Cryptographic algorithms – Digital signatures - Cryptography pragmatics – Replication - System model and group communications – Fault tolerant services – Highly available services – Transactions with replicated data | 10 |

Reading List:

Text Books:

- George Coulouris, Jean Dollimore, Tim Kindberg : Distributed Systems Concepts and Design, Third Edition – 2002- Pearson Education Asia.

Reference Books:

- Tanenbaum : Principle and paradigms,Distributed System ,PHI

PAPER NAME : Seminar
PAPER CODE : MCA 505

Course Objective:

Seminar paper is introduced to develop presentation skills. To learn thoroughly of a particular topic about the recent technologies. Developing language skills and query handling capability. To develop trouble shooting capability in real life.

PAPER NAME : Minor Project
PAPER CODE : MCA 506

Course Objective:

Through the paper Minor Project students will have hands of experience of SDLC. Student will learn how to apply the design and analysis tools of software development. Student will Learn to work in real life project development environments with timelines. Student can develop dedication and spirit of teamwork and providing a training for full semester major project in the next semester.

PAPER NAME : Computer Organization
PAPER CODE : MCA 507

Course Objective:

Identify, understand and apply different number systems and codes. Understand the digital representation of data in a computer system. Understand the general concepts in digital logic design, including logic elements, and their use in combinational and sequential logic circuit design.

Course Outcomes:

- CO1.** To learn how to design and analyze digital logic circuits
- CO2.** To know how to implement standard Combinational and Sequential circuits
- CO3.** Learn about addressing modes and instructions sets of different Microprocessor
- CO4.** To learn about the components of computer including microprocessor, registers and pin configuration
- CO5.** To learn the concept of multiprogramming, parallel processing and interrupts.

| UNIT | CONTENT | HOURS |
|------|---|-------|
| 1 | Introduction to computer organization and architecture, computer hardware, Von Neumann architecture, Min terms, Max terms, Map simplification, combinatorial circuits. Digital component- decoder, encoder, multiplexers, registers, counters. Structure of Pentium and power PC, System buses- PCI, USB, future bus. Integer representation, integer arithmetic, floating point representation and floating point arithmetics. | 12 |
| 2 | Memory organization- memory hierarchy, main memory, cache memory, advanced DRAM. Auxiliary memory- magnetic disks, optical memory, virtual memory. Input / Output- external devices, Input / Output Interface, Modes of Transfer- Programmed I/O, Interrupt-initiated I/O & DMA, I / O processor and channels. | 12 |
| 3 | The Arithmetic and Logic Unit, Computer Instructions – instruction code, instruction formats, instruction sets, instruction cycle, characteristics of machine instruction, addressing modes, assembly language, | 14 |
| 4 | Central Processing Unit – General register organization, Program Interrupt, RISC characteristics, CISC characteristics. Control unit- micro operations, Control of the CPU, Hardware control unit. Basic concept of micro programmed control unit. | 12 |

Reading List:

Text Books:

- Computer System Architecture, M. Morris Mano, Third Edition, Pearson Education

Reference Books:

- Computer Organization and Architecture, William Stallings, Fourth Edition, PHI.

MCA 6TH SEMESTER

PAPER NAME : Major Project
PAPER CODE : MCA 601

Course Objective:

The objective of the MCA project work is to develop quality software solution. During the development of the project, you should involve in all the stages of the software development life cycle like requirements engineering, systems analysis, systems design, software development, testing strategies and documentation with an overall emphasis on the development of reliable software systems. The primary emphasis of the project work is to understand and gain the knowledge of the principles of software engineering practices, so as to participate and manage a large software engineering projects in future.

Course Outcomes:

- CO1.** Student will get exposure to implement practical knowledge in real life applications.
- CO2.** Students will get exposure to enhance skills in problem solving, fault analysis and debugging
- CO3.** Students will be able to discover potential research areas in the field of IT.
- CO4.** Demonstrate an ability to work in a team.
- CO5.** Compare and contrast the existing solutions for the research challenge.
- CO6.** Formulate and propose a plan for creating a solution for the research plan identified.
- CO7.** Report and present the findings of the study conducted in the preferred domain.
- CO8.** Establish a good repo with external organization and get employability skills.