Syllabus of MCA, University of Science and Technology, Meghalaya

ACADEMIC SESSION –2017-18

Course Code: MCA **School Code: SOET**

CREDIT DETAILS for MCA SYLLABUS

1st Semester Papers	Subject Name	Theory/ Practical Marks	Sessional Marks	Total Marks	Course Type
MCA101	Introductory Programming with C	70	30	100	CC
MCA102	Digital Systems (DS)	70	30	100	CC
MCA103	Mathematical Foundation of Computer Science (MFCS)	70	30	100	FC
MCA104	Accounting and financial management (AFM)	70	30	100	CC
MCA105	Fundamental of Computer(FC)	70	30	100	CC
MCA106	Practical-I	100	100	100	CC
			TOTAL	600	
2nd Semester Papers	**Subject Name**	**Theory/ Practical Marks**	**Sessional Marks**	**Total Marks**	
MCA201	Data structure and Algorithms (DSA)	70	30	100	CC
MCA202	Computer Organisation (CO)	70	30	100	CC
MCA203	Computer Network	70	30	100	CC
MCA204	Object Oriented Programming with C++	70	30	100	CC
MCA205	Computer oriented numerical methods & Statistics (CONMS)	70	30	100	FC
MCA206	Practical-II	100	100	100	CC
			TOTAL	600	

3rd Semester Papers	Subject Name	Theory/ Practical Marks	Sessional Marks	Total Marks	Course Type
MCA301	Operating Systems (OS)	70	30	100	FC
MCA302	Design and Analysis of Algorithms (DAA)	70	30	100	CC
MCA303	Database Management Systems (DBMS)	70	30	100	CC
MCA304	Graph Theory (GT)	70	30	100	CC
MCA305	Programming with JAVA	70	30	100	CC
MCA306	Practical-III	100	100	100	CC
			TOTAL	600	
4th Semester Papers	**Subject Name**	**Theory/ Practical Marks**	**Sessional Marks**	**Total Marks**	
MCA401	Formal Languages and Automata Theory (FLAT)	70	30	100	CC
MCA402	Software Engineering(SE)	70	30	100	FC
MCA403	Programming with VB.Net(VB)	70	30	100	CC
MCA404	Web Technology (WT)	70	30	100	CC
MCA405	Computer Graphics(CG)	70	30	100	CC
MCA406	Practical-IV	100	100	100	CC
			TOTAL	600	

5th Semester Papers	Subject Name	Theory/ Practical Marks	Sessional Marks	Total Marks	Course Type
MCA501	Cryptography and Network Security (CNS)	70	30	100	CC
MCA502	Management Information System(MIS)	70	30	100	CC
MCA503	Distributed System(DS)	70	30	100	FC
MCA504	Elective-I	70	30	100	EC
MCA505	Seminar			50	CC
MCA506	Minor Project	100	50	150	CC
MCA507	Computer Organization	70	30	100	MDC
			TOTAL	700	

6th Semester subjects Paper	Subject Name	Theory/ Practical Marks	Sessional Marks	Total Marks	
MCA601	Project Viva and Thesis Exam (PVT)	300	200	500	
			TOTAL	500	

ELECTIVE SUBJECTS: Elective –I	
MCA504.1 Pattern Recognition & Image processing (PR&IP) MCA504.2 Computer based optimisation techniques (CBOT) MCA504.3 Wireless Networks (WN) MCA504.4 Artificial Intelligence (AI) MCA504.5 Data Mining and warehousing (DMW)	

DETAIL SYLLABUS FOR MCA COURSE

MCA 1ST SEMESTER :

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

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 Associatively 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

Reference Books:

1. Balaguruswamy: Programming in ANSI c, TMGH
2. Kanetkar: Let us C, BPB
3. Jeri,Elliot: Problem Solving and Programming Design in C, Pearson

SUBJECT NAME : Digital Systems
PAPER CODE : MCA 102
PRE-REQUISITE : NIL

Reference Books:

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. 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.	16
3	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.	14
4	Memory Devices: Semiconductor memory- RAM, ROM; Magnetic core and surface memory-disk, drum , tape; Access time and cost considerations; Concepts of volatility, random access, serial access, direct access, online and backup storage.	10
5	Basic CPU organization: Simplified functional block diagram of a CPU; Instruction execution process.	9

1. Mano,M.M. : Digital Logic and Computer Design, Pearson
2. Mano,M.M. : Computer System Architecture, Pearson
3. Rajaraman V, Radhakrishnan: An introduction to Digital Computer Design, PHI
4. Tocci : Digital Circuits, PE
5. Leach: Digital Principles & Applications, 7/e, TMH

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

UNIT	CONTENT	HOURS

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

Reference Books:

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

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

1	Accounting concepts and principles, Accounting conventions, principles of Double-entry system of accounting, objectives and advantages of accounting. Classification of Debit and Credit, Cardinal Rules for Debit and Credit, Journalising, Ledger postings, closing and balancing of Ledger Accounts, Subsidiary books, types of cash Book.	12
2	Trial balance, Preparation of trading Account, Manufacturing Account, Profit and loss Account and Balance Sheet for Proprietary concerns.	14
3	Capital Expenditures and revenue Expenditures, Depreciation Accounting.	10
4	Financial Management: Concept, importance and Scope of management accounting and cost accounting, Marginal costing, Break-even analysis.	12
5	Ratio analysis, Fund Flow and cash flow, working capital cycle. Standard costing , Cost variance Analysis, Cost Sheet.	12

Reference Books:

1. Shukla & Grewal, Cost Accounting
2. Chawla, Juneza& Saxena Double Entry Book Keeping and Accounts
3. Anole: Financial Accounting, prentice- Hall
4. Levy and Sarnat: Principles of Financial management, Prentice- Hall

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

Reference Books:

1. *COMPUTERS TODAY BY S.K.BASANDRA, GALGOTIA PUBLICATIONS.*
2. *FUNDAMENTALS OF INFORMATION TECHNOLOGY BY ALEXIS LEON & MATHEWS LEON,*

UNIT	CONTENT	HOURS
1	Computer System Concept and Characteristics, Capabilities ; Time and Space, Complexity of Computers, Concept of Big-O, Big-O Data Structures: Linear, ALU, Stacks, Queues, Arrays	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	Ms-Word **:** 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 **Ms-Excel**: Different Features, Graphs, Cell Formatting, Formulas. MS-Power Point.	14

VIKAS PUBLISHING HOUSE, NEW DELHI.

3. • *MS-OFFICE COMPLETE REFERENCE BPB PUBLICATION*
4.

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

	.Doubly Linked Lists.	
2	Trees : Introduction& Properties of trees; Pedant vertices in a tree; centre of a tree; Rooted binary trees Extended Binary trees; Complete Binary trees; Binary Search Trees; Weight balanced and Height balanced trees; AVL Tree; Balanced Multi-Way Trees; Threaded Binary Trees.	14
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 – Spanning tree algorithms; Fundamental circuits spanning trees of weighted graph	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; Hashing Techniques for Direct Files, Inverted List, Multi-lists Sorting and Searching: Selection Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort Searching technique: Binary Search, Linear Search	10

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.	14
5	Computer arithmetic: Review of addition and subtraction; Multiplication- basic, Booth's array; Division basic restoring, non restoring; Floating point	14

Reference Books:

1. Abo,Hopcroft and Ullman , Data Structures and Algorithms,Addson Wesley Publishing Co.
2. Cormen , Leiserson , Rivest, Introduction to Algorithms, Mil Press & MeGraw - Hill Books Company.
3. Horowitz and Sahni , Fundamentals of Algorithms, Narosa Publishing House .
4. Rauthan & Patel, Expert Data Structures, Khanna Publication Co(Ltd).
5. Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education

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

	arithmetic.	
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

Reference Books:

1. Mano M.M: Computer system Architecture, PHI (EEE)
2. William Stallings, Computer Organisation and architecture, Pearson
3. Stallings : Computer Organization & Architecture, PE
4. Hayes : Computer Architecture & Organization,MGH
5. Hamacher, Vranesic and Zaky: Computer Organization, TMGH

SUBJECT NAME : Computer Networks
PAPER CODE : MCA 203
PRE-REQUISITE : MCA102

UNIT	CONTENT	HOURS
1	Overview: Goals of networking, types, application, topologies, Switching techniques, Standards, performance issues. Network Architecture: ISO-OSI reference model, design philosophy, layer, protocol, interface, and service concepts. Layer-wise functionality.	12
2	Physical Layer: Concepts of data transmission, modulation and multiplexing methods, modem, encoding methods, communication media, standard protocols. 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.	14
3	Data link layer: Framing, error control techniques, data link protocols and their performance. Sliding window protocols, examples of DLL protocols.	10
4	Network Layer: Routing, Congestion and deadlock control algorithms. Internetworking issues and devices, gateways, bridges and routers, IP v4/v6 & X. 25 protocols. Transport layer: Connection management, ICP, X.25.	13
5	Session and presentation layer: Remote procedure call. Data Compression method. Data encryption and decryption. Application layer: Email, Remote login, File transfer, Network file system. Network security-issues, threats, attacks to networks, design of security system, recent trends in network security.	12

Reference Books:

1. Tanenbaum A.S., Computer Network, PHI (EEE).
2. Stevens, UNIX Network Programming, PHI (EEE)
3. Stalling, Data and Computer Communication, PHI (EEE).
4. Forouzan, Data communication and networking, 4th Edn, TMGH

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

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

SUBJECT NAME : Computer Oriented Numerical methods & Statistics
PAPER CODE : MCA 205
PRE-REQUISITE : MCA103

UNIT	CONTENT	HOURS
1	Interpolation-Polynomial Interpolation, difference tables and calculations of difference.	10
2	Numerical differentiation- Newton's Interpolation, Lagrange's interpolation and Newton's divided difference formulae. Numerical integration- Trapezoidal rule, Simpson's (1/3 and 3/8)rules, Gaussian Quadrature formula , Romberg integration	12
3	Simultaneous linear equations- Direct methods: Gauss elimination, Jacobi's. Iterative methods: Gauss-Jordan , Gauss- Seidal	8
4	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	10
5	Probability Theory: sample spaces; Events and probability; Discrete Probability; Union, intersection and compliment of events; conditional probability; Bay's Theorem; Random variables and Distribution: random variables, Discrete Probability Distribution - Binomial, Poisson, Geometric and Hyper geometric distributions; Density functions; Continuous probability distribution	15

Reference Books:

1. Scheld: Numerical Analysis, TMGH
2. Gerald and Wheatley : Applied Numerical Analysis ,Pearson
3. Niyogi : Numerical Analysis and algorithm ,TMGH
4. Schilling and Harris : Applied numerical methods for Engineering, Cengage
5. Chapra : Numerical Methods For Engineers, TMH
6. Hogg,Tanis and Rao: Probability and Statistical Inference , Pearson
7. Yule, U.G., Kendall, M.G: An Introduction to the Theory of statistics, Chalies Griffin and Co.Ltd.

SUBJECT NAME : Operating System
PAPER CODE : MCA 301
PRE-REQUISITE : MCA202

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

Reference Books:

1. Silberschatz A, Galvin P: Operating system concepts, 4th ed. AWP.
2. Milenkovic M.: Operating System- Concepts and Design, MGH Tanenbaum
3. Operating System- Design and Implementation, PHI (EEE).
4. Bach, M.: Design of the UNIX operating system, PHI (EEE).
5. Deitel, Deitel, choffnes, Operating systems, Pearson

SUBJECT NAME : Design and Analysis of Algorithms
PAPER CODE : MCA 302
PRE-REQUISITE : MCA201

UNIT	CONTENT	HOURS
1	Algorithms: 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)	14
4	Graph Algorithms: BFS, DFS, Topological sort, Spanning trees Data Structure based Algorithms : Hashing 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

Reference Books:

1. Cormen, Leiserson, Rivest, Stein: Introduction to algorithms, PHI
2. Aho, Hopcroft and Ullman: The Design and Analysis of Computer Algorithms, PE
3. Dasgupta : Algorithms, TMH
4. Manber, Udi: Introduction to Algorithms. 2/e Addison-Wesley,1994
5. G. Brassard and P. Bratley: Fundamentals of Algorithms. Prentice Hall, 1995

SUBJECT NAME : Database Management System
PAPER CODE : MCA 303
PRE-REQUISITE : MCA201

UNIT	CONTENT	HOURS
1	**Query Processing** : Study of algorithms for selection operations , sorting , join operations , projection , set operations , aggregation ; measurement of cost , evaluation of expressions, transformation of relational expressions , optimization techniques.	12
2	**Parallel Databases** : Introductory concepts ,partitioning techniques , interoperation parallelism - parallel sort (range partitioning sort, parallel external sort-merge), parallel join (partitioned join. fragment-and-replicate join, parallel hash join), interoperation parallelism (pipelined, independent).	12
3	**Distributed Databases** : Replication and fragmentation, network transparency, join processing, distributed transaction processing, two-phase and three-phase commit protocols, handling failure, coordinator selection, concurrency control (locking, timestamping), deadlock handling (centralized, fully distributed), multidatabase systems	10
4	**Object Oriented Databases** : Object classes, inheritance, DAG representation, object identity and persistence (brief introduction to ODMG C++), storage structure for object oriented databases. **Security and Integrity** : Violations, authorization, views, privileges, granting privileges security specification in SQL	12
5	**Introductory concepts on following topics** : Data mining and data warehousing, multimedia databases, distributed information systems, information retrieval systems, spatial and graphical databases, transactions processing monitors, transactional workflows, active and main memory databases. (Example and case studies from ORACLE to be discuss in the course)	15

Reference Books:

1. Silberschats, Kroth and Sudershan, Principles of Database Systems, McGraw Hill Publication
2. Elmasari and Navathe, Fundamentals Of Database System, Narosa Publishing Company, 1989
3. J.D. Ullman, principles of Database Systems, Galgotia Publishing Private Limited
4. C.J. Date, An Introduction to Database Systems, Vol-I and Vol-II, Addison-Wesley Publishing co.

SUBJECT NAME : Graph Theory

PAPER CODE : MCA 304
PRE-REQUISITE : MCA 103

Reference Books:

1. Agnarsson: Graph Theory ,Pearson

UNIT	CONTENT	HOURS
1	Graph: Incidence and degree; Handshaking Lemma; Isomorphism; Sub graphs and Union of graphs; Connectedness: Walks ,Paths and Circuits: Components and correctness algorithms, Shortest Path Algorithms. Eulerian graph, Fleury's algorithm and Chinese postman problem; Hamiltonian graph - necessary and sufficient conditions; Travelling salesman; Bipartite graph.	12
2	Tree: Properties of trees; Pedant vertices in a tree; Centre of a tree; Rooted binary trees; Spanning trees - Spanning tree algorithms; 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.	10
3	Planner 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
4	Colourings: Chromatic number: Chromatic polynomial; The six and five colour theorems; The four colour problem.	6
5	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
6	Switching and coding theory and VLSI design	6

2. Harary : Graph Theory, PHI(EEE).
3. Chartran : Introduction To Graph Theory, TMH
4. Deo, N.: Graph Theory with Applications to Engineering and Computer Science
5. West : Graph Theory, PHI

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

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.	14
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
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	13

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.

Reference Books:

1. PROFESSIONAL JAVA SERVER PROGRAMMING - SPD PUBLICATIONS
2. ADVANCED JAVA LECTURE NOTES
3. BUILDING JAVA ENTERPRISE SYSTEMS WITH J2EE-PAUL PERRONE,VENKATA S.R.KRISHNA,R.CHAGANTITECHMEDIA PUBLICATIONS
4. JAVA THE COMPLETE REFERENCE BY PATRICK NAUGHTON AND HERBERT SCHILDT.
5. PROGRAMMING WITH JAVA BY E. BALAGURUSWAMY TMH PUBLICATIONS ISBN 0-07-463542-5

MCA 4TH SEMESTER :

SUBJECT NAME : FORMAL LANGUAGES AND AUTOMATA THEORY
PAPER CODE : MCA 401
PRE-REQUISITE : MCA103

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. Non Regular Languages: Pumping Lemma and its application.	10
4	Context-free Grammars: Definition and Derivation of languages, Ambiguity in Grammars and languages: CHOMSKY NORMAL FORM (CNF). Pushdown – Automata: Definition, The language of a PDA, Equivalence of PDA and CFG's. Non-Context –free Languages: Application of Pumping Lemma for non-Context free languages.	10
5	Turing Machines: Notations, ID for Turing Machine, i.e., recursively enumerable languages, Acceptability and Halting , Multi Traces Turing Machine. The Church – Turing Thesis. Variants of Turing Machines : Multitape Turing Machine, Non-Deterministic Turing Machine, Enumerator, Equivalence of one tape and multitape Turing Machine	12

Reference Books:

1. Hopcroft, Motwani & Ullman: Introduction to Automata Theory, Languages and Computation 3rd Edn. LPE
2. Theory of Computation: Michal Sipser CENCAGE Learning
3. *Martin : Introduction To Languages & Theory of Computation, TMH*

4.

SUBJECT NAME : SOFTWARE ENGINEERING
PAPER CODE : MCA 402
PRE-REQUISITE : NIL

Reference Books:

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

1. Awad.E.H..System analysis and design
2. Pressman. R.S..Software Engineering: A practitioner's Approach.
3. Rajib Mall; Software Engineering.

SUBJECT NAME : Programming with VB.Net PAPER CODE : MCA 403
PRE-REQUISITE : MCA101

Reference Books:

UNIT	CONTENT	HOURS
1	Introduction, .NET Framework features & architecture, CLR, Common Type System, MSIL, Assemblies, Project basics, IDE, Event driven Programming.	10
2	Console Programming, Data Types, Scope & lifetime of a variable, Control flow statements, Arrays, control array, Subroutine, Functions, Exceptions.	13
3	GUI Programing with windows form, VB.Net Controls, Methods and events, adding controls at runtime, Common dialog control, MDI menu forms.	14
4	Object oriented Programming: Classes & Namespaces, objects, data members, Properties, Methods, raising and handling Events, constructors. Inheritance, Access Specifies, Creating Interfaces, multiple interfaces, My Base & My Class keywords. Concept of OLE, The COM technology, Create User control, register user control, access com component in .net application. Deployment of .NET application.	12
5	Accessing Database with ADO.NET: Create connection, Command, Adapter, Dataset and DataReader controls, Report Generation.	15

1. VB.NET PROGRAMMING BLACK BOOK BY STEVEN HOLZNER –DREAMTECH PUBLICATIONS
2. MASTERING VB.NET BY EVANGELOS PETROUTSOS- BPB PUBLICATIONS
3. INTRODUCTION TO .NET FRAMEWORK-WORX PUBLICATION

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

UNIT	CONTENT	HOURS
1	Introduction to Internet Technology: Overview of Networking protocols and OSI Model. Internetworking Concepts	
2	Internet Protocols and Architecture and Background work: TCP/IP, IP, IP Addressing & Datagrams, IPv6, ARP, RARP, BOOTP, DHCP, ICMP. TCP, UDP, Ports & Sockets, TCP Connection & properties, TCP Segment format, Active & Passive Open Connections. DNS, DNS Server, Email Architecture, SMTP, POP & IMAP, FTP, TFTP. WWW, web server & web browser, HTTP commands & interaction, Architecture of Web browser, CGI, TELNET.	15
3	Web Development Technologies: Client Side Programming: Different client-side scripting: JavaScript VBScript etc. HTML; CSS, XML, DTD; Server Side Programming: Servlets, JSP, Java beans, EJB, Struts, JSF, ASP.NET; Web Servers: IIS, Apache; RIA, Ajax; Types of web pages, ActiveX Controls Java Applets, Tiers in web applications; Database connectivity: ODBC, JDBC.	15
4	Web Security: Confidentiality, authentication, Integrity, Non-repudiation, Access Control, and Availability. Sniffing, spoofing, phishing, pharming. Web Security: Cryptography, Cipher Text, Digital Signature, Digital Certificates. Network Security: SSL, Firewalls, IP Security, VPN.	10
5	Web Services & Middleware: Concept, RPC, CTM, Message Queuing. DCOM & CORBA: basic interface, Architecture; ORB, IDL, IIOP, RMI. Web Services. Wireless Internet: Mobile IP, addressing and its work. WAP: Architecture, Gateway.	10

Reference Books:

1. Achyut S Godbole, Atul Kahate: Wed Technologies – TCP/IP to Internet Architectures, Tata McGraw Hill
2. Deitel & Deitel: Web Technology, Pearson Education
3. Raj Kamal: Internet and Web Technologies, Tata McGraw Hill

PAPER NAME : Computer Graphics

PAPER CODE : MCA 405
PRE-REQUISITE : MCA201

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	12
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 ; The view algorithms; Two - dimensional transformation	15
3	Interactive Graphics : Pointing and positioning devices (cursor,light pen, digitizing tablet, the mouse track balls) , Interactive graphical techniques. Positioning , Elastic lines , Inking , zooming , panning clipping , scissoring, windowing ,censoring ,	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. Multimedia : Introduction to multimedia, Concept of hypertext and hypermedia, Multimedia applications, Basics of Animation, Music and sounds, Audio basic Concepts, Digital and Analog basic concepts. MIDI hardware, MIDI messages, MIDI files, Video: Basic Concepts, Analog and digital video. Imaging and graphics, Image formats, Graphic formats, File format, Image quality and Graphic systems, Compression, Image Compression, Sound Compression, Video Compression.	12

Reference Books:

1. Computer Graphics : Hearn ID .and Baker .P.M. PHI
2. Principles of Interactive computer graphics : Newman W.Sproule, R.F. Mcgraw Hill

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

UNIT	CONTENT	HOURS
1	Course Introduction and terminology 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

Reference Books:

1. W Stallings, "*Cryptography and Network Security: Principles and Practice, 4/e*", Prentice Hall, 2006.
2. A. Menezes, P. van Oorshot and S. Vanstone, *Handbook of Applied Cryptogrphy*, CRC Press, 1997
3. B. Schneier, A*pplied Cryptography,* 2nd Ed, John Wiley & Sons, Inc., 1996.
4. C. Kauffman, R. Perham and M. Speciner, *Network Security: Private Communication in a Public World*, Prentice-Hall, 1994
5. H. C. A. van Tilborg, *Fundamentals of Cryptology,* Kluwer Academic Publishers, 2000.

PAPER NAME : Management Information System

PAPER CODE : MCA 502
PRE-REQUISITE : NIL

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 (EIS or ESS)	10
3	**Telecommunication & Networks**: Communication, Media, Modems & Channels - LAN, MAN & WAN - Network Topologies, Internet, Intranet and Extranet. Wireless technologies like Wi-Fi, Bluetooth and Wi-Max. **Manufacturing & Service System**: Information systems for Accounting, Finance, Production and Manufacturing, Marketing and HRM functions - IS in hospital, hotel, bank.	12
4	**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.	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

Reference Books:

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

PAPER NAME : Distributed System
PAPER CODE : MCA 503
PRE-REQUISITE : MCA203, MCA303

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

Reference Books:

1. George Coulouris, Jean Dollimore, Tim Kindberg "Distributed Systems Concepts and Design" Third Edition – 2002- Pearson Education Asia.
2. Principle and paradigms,Distributed System by Tanenbaum,PHI.

PAPER NAME : Pattern Recognition & Image Processing
PAPER CODE : MCA 504.1

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

Reference Books:

1. Gonslaez, et.a1, "Digital Image Processing", Addison Wesley, Reading, M.A., 1990.

PAPER NAME : Computer Based Optimisation Techniques
PAPER CODE : MCA 504.2

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 Queing system, Interpretation of a model, Single Channel waiting line- (M/M/1) (∞: FIFO), Single channel finite population queue (M/M/1): (C/FIFO), Multichannel Queing problem (Infinite population) (M/M/C): (∞: FIFO), Earlang Distribution (M/Ek/1): (∞: FIFO).	10

Reference Books:

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

PAPER NAME : Wireless Network
PAPER CODE : MCA 504.3

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	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	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

Reference Books:

1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2003.
2. William Stallings, "Wireless Communications and Networks", Pearson Education, 2002.
3. Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", First Edition, Pearson Education, 2003.
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
5. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.

PAPER NAME : Artificial Intelligence
PAPER CODE : MCA 504.4

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 monotic 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. Basic syntax and semantics of lips and prolog. Programming exercise from ai in lips.	13

Reference Books:

1. Artficial Intelligence By Patrick,Henry,Winston , Pearson Education
2. Artificial Intelligence By Rich and Night
3. Introduction to Artificial Intelligence By Charniak, Mc Dermott, Pearson Education
4. Artificial Intelligence By Nilson

PAPER NAME : Data Mining and Warehousing
PAPER CODE : MCA 504.5

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 Temporal Data Mining Issues and challenges in Data mining, Data mining application areas (example with practical case studies)	13

Reference Books:

1. Data Mining Techniques, By Arun K. Pujari (University Press)
2. Data Mining Concepts and Techniques, By Han and Kamber (Morgan Kaufmann and Harcourt India)
3. Data Mining, By Peter Adriaans, Dolf Zantinge (Pearson Education Asia)
4. Algorithms for Clustering Data, By K. Jain and R. C. Dukes (Prentice Hall)
5. Data Warehouse, from Architecture to Implementation.- by Barry Devlin (Addison Wesley language)
6. Data Warehousing in the Real World. By Sam Anahory, Dennis Murray (Pearson Education Asia)

PAPER NAME : Computer Organization & Architecture

PAPER CODE : MCA 507 (MDC)

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 arithmetic .	
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.	
3	The Arithmetic and Logic Unit, Computer Instructions – instruction code, instruction formats, instruction sets, instruction cycle, characteristics of machine instruction, addressing modes, assembly language.	
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.	

Text and Reference Books:

1. Computer System Architecture, M. Morris Mano, Third Edition, Pearson Education.
2. Computer Organization and Architecture, William Stallings, Fourth Edition, PHI.