

M.SC. (COMPUTER SCIENCE) SYLLABUS 2019 BATCH ONWARDS
(UPDATED ON 24.05.2019)

1ST SEM.

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
MSCCS1-101	Professional Communication	4	1	0	40	60	100	5
MSCCS1-102	Discrete Structures	4	1	0	40	60	100	5
MSCCS1-103	Database Management System	4	1	0	40	60	100	5
MSCCS1-104	Programming Using C	4	1	0	40	60	100	5
MSCCS1-105	Software Lab I(Based on MCAP3-104)	0	0	4	60	40	100	2
MSCCS1-106	Software Lab II(Based on MCAP3-103)	0	0	4	60	40	100	2
Total		16	4	8	280	320	600	24

2ND SEM.

Course		Contact Hrs.			Mark s			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
MSCCS1-201	Computer Organization and Assembly Language	4	1	0	40	60	100	5
MSCCS1-202	Operating System	4	1	0	40	60	100	5
MSCCS1-203	Software Engineering	4	1	0	40	60	100	5
MSCCS1-204	Data Structures Using C++	4	1	0	40	60	100	5
MSCCS1-205	Software Lab III(Based on MCAP3-208)	0	0	4	60	40	100	2
MSCCS1-206	Software Lab IV(Based on MCAP3-210)	0	0	4	60	40	100	2
Total		16	4	8	280	320	600	24

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3RD SEM.

Course		Contact Hrs.			Marks			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
MSCCS1-301	Computer Graphics	4	1	0	40	60	100	5
MSCCS1-302	Theory of Computation	4	1	0	40	60	100	5
MSCCS1-303	Research Methodology	4	1	0	40	60	100	5
MSCCS1-304	Web Technology	4	1	0	40	60	100	5
MSCCS1-305	Software Lab V(Based on MCAP3-313)	0	0	4	60	40	100	2
MSCCS1-306	Software Lab VI(Based on MCAP3-316)	0	0	4	60	40	100	2
Total		16	4	8	280	320	600	24

4TH SEM.

Course		Contact Hrs.			Mark s			Credits
Code	Name	L	T	P	Int.	Ext.	Total	
MSCCS1-401	Data Communication and Networks	4	1	0	40	60	100	5
MSCCS1-402	Artificial Intelligence	4	1	0	40	60	100	5
MSCCS1-403	Programming with Python	4	1	0	40	60	100	5
MSCCS1-404	Data Analytics	4	1	0	40	60	100	5
MSCCS1-405	Software Lab VII(Based on MCAP3-421)	0	0	4	60	40	100	2
MSCCS1-406	Major Project	0	0	8	40	60	100	4
Total		16	4	12	260	340	600	26

Total Credits: 24 + 24 + 24+ 26 = 98

PROFESSIONAL COMMUNICATION

Subject Code:- MSCCS1-101

L T P C
4 1 0 5

Duration: 75 Hrs.

Unit-I (19 Hrs.)

Basics of Technical Communication: Functions of Communication-Internal & External Functions, Models-Shannon & Weaver's model of communication, Flow, Networks and importance, Barriers to Communication, Essential of effective communication (7 C's and other principles), Non-verbal Communication.

Unit-II (18 Hrs.)

Basic Technical Writing: Paragraph writing (descriptive, Imaginative etc.), precise writing, reading and comprehension, Letters – Format & various types.

Unit-II (19 Hrs.)

Advanced Technical Writing: Memos, Reports, E-Mails & Net etiquettes, Circulars, Press Release, Newsletters, Notices. Resume Writing, Technical Proposals, Research Papers, Dissertation and Thesis, Technical Reports, Instruction Manuals and Technical Descriptions, Creating Indexes, List of References and Bibliography.

Unit-IV (19 Hrs.)

Verbal Communication: Presentation Techniques, Interviews, Group Discussions, Extempore, Meetings and Conferences.

Technical Communication: MS-Word, Adobe Frame maker and ROBO Help.

Recommended Books:

1. Vandana R. Singh, 'The Written Word', Oxford University Press, New Delhi.
2. K.K. Ramchandran, et al, 'Business Communication', Macmillan, New Delhi.
3. Swati Samantaray, 'Business Communication and Communicative English', Sultan Chand, New Delhi.
4. S.P. Dhanavel, 'English and Communication Skills for Students of Science and Engineering (with audio CD)'.

DISCRETE STRUCTURES

Subject Code:- MSCCS1-102

L T P C
4 1 0 5

Duration: 75 Hrs.

UNIT-I (19 Hrs.)

Mathematical Logic - Connectives, well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, predicates, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theory Proving.

UNIT-II (18 Hrs.)

Set Theory - Properties of binary Relations, equivalence, compatibility and partial ordering relations, Hasse diagram, Functions, Inverse functions, Composition of functions, Recursive functions, Lattice and its properties.

UNIT-III (19 Hrs.)

Graph Theory - Definition, Representation, path Matrix Warshalls. Algorithm, MINIMA Algorithm, Isomorphism, sub graphs, connected components, cyclic graph, Bipartite graph, Planar graph, Euler's formula, Euler circuit, Hamiltonian Graph, Chromatic number, Trees, Spanning tree of a Graph, Breadth – First & Depth – First Spanning trees, Binary Tree, Conversion of a tree to binary tree. Tree traversals, Representation of Expressions by Binary tree, Forest, Binary search trees.

UNIT-IV (19 Hrs.)

Combinatorics & Recurrence Relations - Disjunctive & Sequential counting, Combinations & Permutations, Enumeration without repetition Recurrence relation, Fibonacci relation, solving recurrence relation by substitution, solving non-linear recurrence relation by conversion to linear recurrence relation.

Recommended Books

1. J.P. Trembly, P. Manohar, 'Discrete Mathematical Structures with Applications to Computer Science', McGraw Hill.
2. J.L. Mott, A. Kandel, T.P. Baker, 'Discrete Maths for Computer Scientists & Mathematicians', Prentice Hall.

DATABASE MANAGEMENT SYSTEM

Subject Code:- MSCCS1-103

**L T P C
4 1 0 5**

Duration: 75 Hrs.

UNIT-I (19 Hrs.)

Introduction to Data, Field, Record, File, Database, Database management system. Structure of database system, Advantage and disadvantage, levels of database system, Relational model, hierarchical model, network model, comparison of these models, E-R diagram, different keys used in a relational system, SQL

UNIT-II (18 Hrs.)

DBA, responsibilities of DBA, Relational form like 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, DBTG, concurrency control and its management, protection, security, recovery of database.

UNIT-III (19 Hrs.)

SQL: Introduction to SQL-DDL, DML, DCL, join methods & sub query, Union Intersection, Minus, Tree Walking, Built in Functions, views.

UNIT- IV (19 Hrs.)

Security:- amongst users, Sequences, Indexing Cursors- Implicit & Explicit, Procedures, Functions & Packages Database Triggers. Big Data: Introduction to Big Data and Analytics, Introduction to NoSQL.

Recommended Books:

1. C.J. Date, 'Introduction to DatabaseSystem'.
2. B.C. Desai, 'Database ManagementSystem'.
3. Korth, 'DatabaseConcept'.

PROGRAMMING USING C

Subject Code:- MSCCS1-104

**L T P C
4 1 0 5**

Duration: 75 Hrs.

UNIT-I (19 Hrs.)

Algorithm and Programming Development: Steps in development of a program, Flow charts, Algorithm Development, Program Debugging, Compilation and Execution.

Fundamentals of 'C': I/O statements, Assignment Statements, Constants, Variables, Operators and Expressions, standard and formatted statements, Keywords, Data types and Identifiers.

UNIT-II (18 Hrs.)

Control Structures: Introduction, Decision making with if – statement, if-else and Nested if, while and do-while, for loop. Jump statements: break, continue, goto, switch Statement
Functions: Introduction to Functions, Function Declaration, Function Categories, Standard Functions, Parameters and Parameter Passing, Call – by value/reference, Recursion, Global and Local Variables, Storage classes.

UNIT-III (19 Hrs.)

Arrays: Introduction to Arrays, Array Declaration, Single and Multidimensional Array, Memory Representation, Matrices, Strings, String handling functions.
Structure and Union: Declaration of structure, Accessing structure members, Structure Initialization, Arrays of structure, nested structures, Unions.

UNIT- IV (19 Hrs.)

Pointers: Introduction to Pointers, Address operator and pointers, Declaring and Initializing pointers, Assignment through pointers, Pointers and Arrays
Files: Introduction, creating a data file, opening and closing a data file, processing a data file.
Preprocessor Directives: Introduction and Use, Macros, Conditional Preprocessors, Header Files.

Recommended Books:

1. Yashvant P. Kanetkar, 'Let us C', 7thEdn., BPB Publications, NewDelhi.
2. E. Balagurusami, 'Programming in ANSI C', 4thEdn., Tata McGrawHill.
3. Byron S. Gottfried, 'Programming in C', 2ndEdn., McGrawHill.
4. Kernighan & Richie, 'The C Programming Language', 2ndEdn., PHIPublication.
5. R. Lafore, 'Object Oriented Programming', 3rdEdn., GalgotiaPublications.
6. R.S. Salaria, 'Problem Solving and Programming in C', 2ndEdn.

SOFTWARE LAB I(BASED ON MCAP3-104)

Subject Code: - MSCCS1-105 **L T P C**
0 0 4 2

Objectives and Expected Outcomes: The objective of this course is to help the students in finding solutions to various real life problems and converting the solutions into computer program using C language (structured programming). Students will learn to write programs for solving various real- life problems.

- 1.Input-Output Statements:** formatted and non-formatted statements.
- 2.Decision Making:** switch, if-else, nested if, else-if ladder, break, continue, goto.
- 3.Loops:** while, do-while, for.
- 4.Functions:** definition, declaration, variable scope, parameterized functions, return statement, call by value, call by reference, recursive functions.
- 5.Arrays:** Array declarations, Single and multi-dimensional, memory limits, strings and string functions.
- 6.Files:** Creation and editing of various types of files, closing a file (using functions and without functions).

SOFTWARE LAB II(BASED ON MCAP3-103)

Subject Code:- MSCCS1-106 **L T P C**
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP3- 103 providing Operational Knowledge and Implementation of Database using SQL.

COMPUTER ORGANIZATION AND ASSEMBLY LANGUAGE

Subject Code: - MSCCS1-201L T PC

Duration: 75 Hrs.

4 10 5

Objectives: The objective of the course is to provide students with a solid foundation in computer design. Examine the operation of the major building blocks of a computer system. To introduce students to the design and organization of modern digital computers & basic assembly language.

Unit-I (19 Hrs.)

Computer Organization: Basic Computer Organization, Bus & Memory Transfer, Stored Program Organization, Computer Registers, Computer Instructions, Timing and Control, Hardwired based design of Control Unit, Instruction Cycle, Formats of Various types of Instructions- Memory Reference Instructions, Register Reference Instructions & I/O Instructions, General Register Organization-Control word, Design of Adder & Logic Unit, Stack Organization-Register Stack, Memory Stack, Reverse Polish Notation Addressing Modes, RISC vs CISC Architectures, Interrupts & types.

Unit-II (18 Hrs.)

Pipeline & Vector Processing: Parallel Processing, Pipelining-Arithmetic & Instruction Pipeline, Vector Processing-Vector operations, Memory Interleaving, Array Processors. Input – Output Organization: Input-Output Interface- I/O vs Memory Bus, Isolated vs Memory mapped I/O, Synchronous Data Transfer, Asynchronous Data Transfer- Strobe Control, Handshaking, Asynchronous Communication Interface, Modes of Transfer- Programmed I/O, Interrupt Initiated I/O, Interrupt Cycle, Priority Interrupt Controller, and DMA Controller & DMA Transfer.

Unit-III (19 Hrs.)

Memory Organization: Main Memory-Memory Address Map, Memory connection to CPU, Associative Memory-Hardware organization, Match Logic, Cache Memory-Levels of Cache, Associative Mapping, Direct Mapping, Set-Associative Mapping, writing into Cache, Cache coherence, Virtual Memory-Address space & Memory space, Address mapping using pages, Associative memory page table, Page replacement, Memory Management Hardware – Segmented page mapping, Multiport memory, Memory protection.

Unit-IV (19 Hrs.)

Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures- Time Shared Common Bus, Crossbar switch, Multistage Switching Network, Hypercube interconnection, Interprocessor communication & synchronization.

Assembly Language Programming: Example of a typical 8-bit processor (8085 microprocessor)-Registers, addressing modes, Instruction Set-Data Transfer Instructions, Arithmetic Instructions, Logical Instructions, Program Control Instructions, Machine Control Instructions, Use of an Assembly Language for specific programmes: Simple numeric manipulations, sorting of a list and use of I/O instructions.

Recommended Books:

1. Car Hamacher, Zvonks Vranesic, Safwat Zaky 'Computer Organization', 5th Edn., McGraw Hill.
2. M.M. Mano, 'Computer System Architecture', Prentice Hall of India, 1986.
3. John Paul Hayes, 'Computer Architecture and Organization', McGraw Hill International Edn.
4. A.S. Tanenbaum, 'Structured Computer Organization', Prentice Hall of India.

OPERATING SYSTEM

Subject Code: - MSCCS1-202
4 1 0 5

L T P C

Duration: 75 Hrs.

UNIT-I (19 Hrs.)

Basics of Operating Systems: Definition, Types of Operating Systems: Mainframe, Desktop, Multiprocessor, Distributed, Clustered, Real time, Embedded and Time sharing. Simple, Layered, Monolithic and Microkernel Operating Systems. Virtual systems.

Operating System Components: Process Management, Memory Management component, I/O Management, File Management, Protection System and Network management.

Operating System Services: Process Execution, I/O operations, File manipulations, Communications, Error detection and recovery, Resource allocation, Accounting, System, Protection, System Calls and System Call Execution; API.

UNIT-II (18 Hrs.)

Process: Definition, Process Relationships, Process states, Process State transitions, Process Control Block, Context switching. Threads - Concept, Types and advantages of Multithreads. **Process Scheduling:** Definition, Scheduling objectives, Types of Schedulers, Scheduling criteria, CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time, Scheduling algorithms - Pre-emptive and Non pre-emptive, FCFS, SJF and RR. Multiprocessor schedulers. Performance evaluation of schedulers.

Inter-process Communication and Synchronization: Definition, Shared Memory System, Message passing, Critical section, Mutual Exclusion, Semaphores.

Deadlocks: Definition, Deadlock characteristics, Deadlock Prevention, Deadlock Avoidance, Deadlock detection and Recovery.

UNIT-III (19 Hrs.)

Basic Memory Management: Definition, Logical and Physical address map, Memory allocation, Contiguous, Fixed and variable partition. Internal and External fragmentation and Compaction; Paging - Principle of operation, Page allocation, Hardware support, Protection and sharing; Segmentation, Segmentation with Paging.

Virtual Memory Management: Basics of Virtual Memory, Hardware and control structures, Locality of reference, Page fault, Working Set, Dirty page/Dirty bit; Demand paging, Page replacement policies - Optimal (OPT), First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

UNIT-IV (19 Hrs.)

Device Management: Hardware I/O organization, I/O control, Port and memory mapped I/O, DMA, Buffering and Caching. Device Drivers.

Disk Management: Disk Structure, Disk Formatting, Disk Scheduling and its algorithms, RAID.

Security: Authentication; Types of Threats, Detection, Prevention and correction of Threats.

File Management: File concept, File attributes - Name, Identifier, Type, Location, Size, Time, Date, user identification, File Operations, Directory Structure - Single level, two level, Tree Structure. Disk space allocation methods - Contiguous, Linked, Indexed. Access Methods - Sequential, Indexed, Random access, File system structure, Byte sequence, Record sequence and Tree-based. Disk formatting.

Security and Protection: Security threats, Security Policies and Mechanisms, Authentications.

Recommended Books:

1. William Stalling, 'Operating System Internals and Design Principle', 6th Edn., Pearson Education, India, 2009.
2. Peterbars Galvin, 'Operating System Principle', 7th Edn., Wiley India, 2009.

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3. J. Harris, 'Operating System SCHAUM'S OUTLINE', Tata McGraw Hill, Special Indian Edn., 2008.
4. Pramod Chandra, 'An Introduction to Operating System', 3rd Edn., PHI, 2010.

SOFTWARE ENGINEERING

Subject Code: - MSCCS1-203

L T P C
4 1 0 5

Duration: 75 Hrs.

Course Objective: To apply principles of software development and evolution. To specify, abstract, verify, validate, plan, develop and manage large software and learn emerging trends in software engineering.

UNIT-I (19 Hrs.)

Introduction to Software: Definition, Software characteristics, Software components, Software Applications.

Introduction to Software Engineering: Definition, Software Engineering Paradigms, Waterfall Model, Prototyping Model, Interactive Enhancement Model, the Spiral Model.

UNIT- II (18Hrs.)

Software Metrics: Role of Metrics and Measurement, Metrics for software productivity and quality, Measurement software, size-oriented metrics, function oriented metrics, Metrics for software quality.

Software Requirement Specification (SRS): Problem analysis, structuring information, Data flow diagram and data dictionary, structured analysis, Characteristics and component of (SRS).

UNIT- III (19Hrs.)

Planning a Software Project: Cost estimation, uncertainties in cost estimation, Single variable model, COCOMO model, Project scheduling and milestones, Software & Personal Planning, Verification & Validation (V & V), inspection & review.

System Design: Design Objectives, Design Principles, problem, Partitioning, Abstraction, Top Down and Bottom-up techniques, Structure Design, Structure Charts, Design Methodology.

UNIT- IV (19Hrs.)

Coding: Coding by Top-down and Bottom-up, Structured Programming, Information Hiding, Programming style, Internal Documentation.

Testing: Level of testing, Test cases and test criteria, Functional Testing, Structural Testing.

Recommended Books:

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Sixth Edition, McGraw Hill.
2. R.E. Fairley, "Software Engineering Concepts", Paperback Edition, McGraw Hill.
3. Pankaj Jalote, "An Integrated Approach to Software Engineering", Third Edition, Narosa Publishing House.

DATA STRUCTURES USING C++

Subject Code: - MSCCS1-204

L T P C
4 1 0 5

Duration: 75 Hrs.

Basic Concepts: Introduction to Complexity, Data Structure and Data Structure operations. Applications of Data Structure, Basic data Structures.

Arrays: Introduction, Types of Array, Memory representation, Applications and operations.

Stacks: Introduction, memory representation, Applications and operations.

UNIT- II (18Hrs.)

Linked List: Operations like traversing, searching, inserting, deleting, operations on header-linked list, circular linked list, doubly linked list, memory representation.

Queue: Introduction, Operations on EnQueue and Dequeue, Memory Representation and Applications.

UNIT- III (19Hrs.)

Trees – Definition and Basic concepts, Representation in Contiguous Storage, Binary Tree, Binary Tree Traversal, Searching, Insertion and deletion in Binary trees, Binary Search tree.

UNIT- IV (19Hrs.)

Searching: Binary and Linear Search.

Sorting: Bubble sort, Insertion sort, Selection sort, Merge Sort, Quick sort.

Recommended Books:

- 1.Tenenbaum, Y. Lanhghsam and A. J. Augenstein, “Data Structures Using C and C++”, Prentice Hall of India.
- 2.Seymour Lipschutz “Theory & Practice of Data Structures”, McGraw Hill.

SOFTWARE LAB III (BASED ON MCAP3-208)

Subject Code: - MSCCS1-205

**L T P C
0 0 4 2**

This laboratory course will comprise an exercises to supplement what is learnt under paper MCAP3-208 Operating System.

SOFTWARE LAB IV(BASED ON MCAP3-210)

Subject Code:- MSCCS1-206

**L T P C
0 0 4 2**

This laboratory course will comprise an exercises to supplement what is learnt under paper MCAP3-210 Data structures Using C++.

COMPUTER GRAPHICS

**Subject Code: - MSCCS1-301
Hrs.**

**L T P C
4 1 0 5**

Duration: 75

Course Objectives: At the end of the course, the students should be able to:

1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
3. Use of geometric transformations on graphics objects and their application in composite form.

UNIT-I (19 Hrs.)

Computer Graphics- Introduction, Applications of computer graphics, Components of Computer Graphics System. Input & Output Devices- Keyboard, Touch panel, Light pens, Graphic tablets, Joysticks, Trackball, Data glove, Digitizer, Image scanner, Mouse, Voice

Systems, Impact and nonimpact printers. Video Display Devices- CRT systems, Random and Raster Scan Systems, Direct view storage tube.

Flat panel displays – Emissive vs Non-Emissive displays, LCD displays, Plasma Panel displays, 3-D viewing devices, Virtual Reality.

UNIT–II (18 Hrs.)

Scan Conversion- DDA and Bresenham line algorithms, Midpoint circle algorithm, Midpoint ellipse algorithm, Area filling techniques (Boundary fill, Flood fill, scan line area fill algorithm), character generation, limitations of scan conversion.

2-Dimensional Graphics- 2D Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection, Shearing), Composite transformations, two dimensional viewing transformation and clipping (Cohen –Sutherland, Sutherland-Hodge man algorithms).

UNIT–III (19 Hrs.)

3-Dimensional Graphics- 3D Cartesian and Homogeneous co-ordinate system, Geometric transformations (translation, Scaling, Rotation, Reflection), Composite transformations. Mathematics of Projections – Perspective Projections, Anomalies of perspective projections, Parallel Projections, Introduction to 3D viewing pipeline and clipping.

UNIT–IV (19 Hrs.)

Hidden Line and Surface Elimination Algorithms- Z-buffer, scan-line, Painter's algorithm. Illumination Models- Diffuse reflection, Specular reflection, refracted light, texture surface patterns, Half toning, Dithering.

Recommended Books:

1. D. Hearn and M.P. Baker, 'Computer Graphics', 2nd Edn., Pearson, **2002**.
2. Andries van Dam, F. Hughes John, James D. Foley; Steven K. Feiner, 'Computer Graphics Principles and Practice in C', 2nd Edn., Pearson, **2002**.
3. Roy A. Plastock, 'Computer Graphics', 2nd Edn., McGraw Hill, **2000**.
4. F.S. Hill, 'Computer Graphics using OpenGL', 3rd Edn., PHI, **2009**.
5. Jeffrey McConnell, 'Computer Graphics: Theory into Practice', 1st Edn., Jones and Bartlett Publishers, **2005**.
6. William M. Newman, 'Principles of Interactive Computer Graphics', 2nd Edn., McGraw Hill, 2001.

THEORY OF COMPUTATION

Subject Code: - MSCCS1-302
Hrs.

L T P C

Duration: 75

4 1 0 5

Course Objectives :

After completion of this course, the students would be able to:

1. Design a finite automaton to recognize a given regular language and transform a language into regular expression or finite automaton or transition graph.
2. Define deterministic and nondeterministic finite automata and prove properties of regular languages and their classification.
3. Build a context-free grammar for pushdown automata.
4. Design Turing machine and Post machine for a given language.

UNIT-I (19 Hrs.)

Finite Automata - Formal language, need for formal computational models, Non computational models, Deterministic finite Automata, Non deterministic finite Automata, Equivalence of NFA and DFA, 2-Way Finite Automata, Moore and Mealy Machine.

UNIT-II (18 Hrs.)

Regular Expression and Languages - Regular expression, Equivalence of finite Automata and Regular expressions, Conversion between regular expressions and finite Automata, Application of Regular Expressions, Lexical analysis, Finding pattern in text.

UNIT-III (19 Hrs.)

Regular Languages and Regular Sets - Pumping lemma for regular sets, Applications of pumping lemma. Closure properties of regular language, Minimization of finite Automata. Pushdown Automata - Pushdown Automata, Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context free grammar.

UNIT-IV (19 Hrs.)

Context Free Grammar and Languages - Context free Grammars, Derivation Trees, Leftmost and rightmost derivations, Ambiguity, Parsing techniques for parsing of general CFG's, Properties of Context free Languages, Normal forms for context free grammars, The Pumping Lemma for context free Languages, Closure properties of context free languages. Turing Machine (TM) - One Tape, multi-tape.

Recommended Books:

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, 'Introduction to Automata Theory, Languages and Computation', 3rd Edn., Pearson, **2006**.
2. Daniel I.A. Cohen, 'Introduction to Computer Theory', 2nd Edn., Wiley, **2011**.
3. Adesh K. Pandey, 'Theory of Automata and Computation', S.K. Kataria & Sons, **2013**.
4. K.L.P. Mishra, 'Theory of Computer Science: Automata, Languages and Computation', 3rd Edn., Prentice Hall India Course Private Limited, **2006**.

RESEARCH METHODOLOGIES

Subject Code: - MSCCS1-303
Hrs.

L T P C
4 1 0 5

Duration: 75

UNIT-I (19 Hrs.)

Introduction to Research: Meaning, Definition, Objective and Process Research Design: Meaning, Types - Historical, Descriptive, Exploratory and Experimental Research Problem: Necessity of Defined Problem, Problem Formulation, Understanding of Problem, Review of Literature Design of Experiment: Basic Principal of Experimental Design, Randomized Block,

Completely Randomized Block, Latin Square, Factorial Design. Hypothesis: Types, Formulation of Hypothesis, Feasibility, Preparation and Presentation of Research Proposal

UNIT-II (18 Hrs.)

Sources of Data: Primary and Secondary, Validation of Data Data Collection Methods: Questionnaire Designing, Construction Sampling Design & Techniques – Probability Sampling and Non Probability Sampling Scaling Techniques: Meaning & Types Reliability: Test – Retest Reliability, Alternative Form Reliability, Internal Comparison Reliability and Scorer Reliability Validity: Content Validity, Criterion Related Validity and Construct Validity

UNIT-III (19 Hrs.)

Data Process Operations: Editing, Sorting, Coding, Classification and Tabulation Analysis of Data: Statistical Measure and Their Significance, Central Tendency, Dispersion, Correlation: Linear and Partial, Regression: Simple and Multiple Regression, Skewness, Time series Analysis, Index Number Testing of Hypothesis: T-test, Z- test, Chi Square, F-test, ANOVA

UNIT – IV (19 Hrs.)

Multivariate Analysis: Factor Analysis, Discriminant Analysis, Cluster Analysis, Conjoint Analysis, Multi-Dimensional Scaling Report Writing: Essentials of Report Writing, Report Format Statistical Software: Application of Statistical Softwares like SPSS, MS Excel, Mini Tab or MATLAB Software in Data Analysis *Each Student has to Prepare Mini Research Project on Topic/ Area of their Choice and Make Presentation. The Report Should Consists of Applications of Tests and Techniques Mentioned in The Above UNITS.

Recommended Books:

1. R.I. Levin and D.S. Rubin, 'Statistics for Management', 7 th Edn., Pearson Education New Delhi.
2. N.K. Malhotra, 'Marketing Research–An Applied Orientation', 4 th Edn., Pearson Education New Delhi.
3. Donald Cooper, 'Business Research Methods', Tata McGraw Hill, New Delhi.
4. Sadhu Singh, 'Research Methodology in Social Sciences', Himalaya Publishers.

WEB TECHNOLOGIES

Subject Code: - MSCCS1-304

**L T P C
4 1 0 5**

Duration: 75 Hrs.

UNIT-I (19 Hrs.)

Internet and World Wide Web: Introduction, Internet Addressing, ISP, types of InternetConnections, Introduction to WWW, WEB Browsers, WEB Servers, URLs, HTTP, WEB Applications, Tools for web site creation.

HTML5: Introduction to HTML5, Lists, adding graphics to HTML5 page, creating tables,linking documents, forms, frames, Cascading Style sheets.

UNIT-II (18 Hrs.)

Java Script: Introduction, programming constructs: variables, operators and expressions,conditional checking, functions and dialog boxes, JavaScript DOM, creating forms, introduction to Cookies, JQuery.

UNIT-III (19 Hrs.)

AJAX: Introduction, HTTP Request, XML Http Request, AJAX Server Script.

UNIT-IV (19 Hrs.)

PHP: Introduction, syntax, statements, operators, PHP and MySQL, PHP and AJAX.

Recommended Books:

1. Ivan Bayross, 'Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl CGI', BPB.
2. Steven M. Schafer, 'HTML, CSS, JavaScript, Perl, Python and PHP', Wiley India.
3. Paul S. Wang, G. Keller, S. Katila, 'An Introduction to Web Design + Programming', Cengage Learning.
4. Jeffery C. Jackson, 'Web Technologies: A Computer Science Perspective', PearsonEducation.
5. Robin Nixon, 'Learning PHP, MySQL and JavaScript', Shroff/O'Reilly.

SOFTWARE LAB V (BASED ON MCAP3-313)

Subject Code: - MSCCS1-305

**L T P C
0 0 4 2**

This laboratory course will comprise an exercises to supplement what is learnt under paper MCAP3-313 Computer Graphics.

SOFTWARE LAB VI (BASED ON MCAP3-316)

Subject Code: - MSCCS1-306

**L T P C
0 0 4 2**

This laboratory course will comprise an exercises to supplement what is learnt under paper MCAP3-316 Web application and development.

DATA COMMUNICATION AND NETWORKS

Subject Code: - MSCCS1-401

**L T P C
4 1 0 5**

Duration: 75 Hrs.

Objectives: As part of this course, students will be introduced to Computer Networks and Data Communication paradigms, about Network models and standards, Network protocols and their use, wireless technologies.

UNIT-I (19 Hrs.)

Introduction to Data Communication: Components of Data Communication, Data Representation, Transmission Impairments, Switching, Modulation, Multiplexing.

Review of Network Hardware: LAN, MAN, WAN, Wireless networks, Internetworks.

Review of Network Software: Layer, Protocols, Interfaces and Services. **Review of**

Reference Models: OSI, TCP/IP and their comparison.

Physical Layer

Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (Radio, Microwave, Infrared). Introduction to ATM, ISDN, Cellular Radio and Communication Satellites.

UNIT-II (18 Hrs.)

Data Link Layer Services provided by DLL: FRAMING, ERROR CONTROL, FLOW CONTROL, MEDIUM ACCESS.

Medium Access Sub Layer: Channel Allocation, MAC protocols – ALOHA, CSMA protocols, Collision free protocols, Limited Contention Protocols, Wireless LAN protocols, IEEE 802.3, 802.4, 802.5 standards and their comparison.

UNIT-III (19 Hrs.)

Network Layer: Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast). Congestion Control Algorithms (Leaky bucket, Token bucket, Load shedding), Internetworking, IP Protocol, ARP, RARP.

Network Trouble Shooting: Using Ping, Traceroute, IPconfig, Netstat, nslookup.

UNIT-IV (19 Hrs.)

Transport Layer : Addressing, Establishing and Releasing Connection, Flow Control, Buffering, Internet Transport Protocol (TCP and UDP).

Application Layer: Domain name system, E-mail, File transfer protocol, HTTP, HTTPS, World Wide Web.

Recommended Books:

1. Tanenbaum, Andrew S., 'Computer Networks', 4th Edn., PHI, 2009.
2. B.A. Forouzan, 'Data Communications and Networking', 4th Edn., Tata McGraw Hill, 2009.
3. Douglas E. Comer, 'Internetworking with TCP/IP (Vol.1, 4th Edition)', CPE 2004.
4. Stallings, William, 'Data and Computer Communications', 8th Edn., PHI, 2008.
5. Nance, Bary, 'Introduction to Networking', 4th Edn., PHI, 1997.

ARTIFICIAL INTELLIGENCE

Subject Code: - MSCCS1-402

L T P C
4 1 0 5

Duration: 75 Hrs.

UNIT-I (19 Hrs.)

Basics of AI - What is Artificial Intelligence, what is an AI technique, Criteria for success, Problems, Problem spaces and search, Production system, Problem characteristics, Hillclimbing, Best-First search, AO algorithm, Constraint satisfaction.

UNIT-II (18 Hrs.)

Natural Language Processing - Introduction, Overview of linguistics, Grammars and language, Basic Parsing techniques, Semantic analysis and representation, Structure, Natural Language generation, Natural Language systems.

UNIT-III (19 Hrs.)

Knowledge Representation - Issues, Approaches to knowledge Representation, Representing simple facts in logic, Computable functions and predicates, Procedural vs declarative knowledge, Forward vs Backward Reasoning matching, Control knowledge.

UNIT-IV (19 Hrs.)

Expert Systems - Rule-Based system architecture, Non-production system Architecture, dealing with uncertainty, Knowledge acquisition and validation, Knowledge system Building tools.

Recommended Books

1. Elaine Rich and Kevin Knight, 'Artificial Intelligence', 5 th Edn., Tata McGraw Hill, **2014**.
2. Dan. W. Patterson, 'Introduction to Artificial Intelligence and Expert Systems', 1st Edn., Prentice Hall India, **2015**.
3. Eugene Charniak and Drew McDermott, 'Introduction to Artificial Intelligence', 1st Edn., Pearson Education, **2002**.

PROGRAMMING WITH PYTHON

Subject Code: - MSCCS1-403

L T P C
4 1 0 5

Duration: 75 Hrs.

UNIT-I (19 Hrs.)

Introduction to Python: Python Installation and Working with Python Understanding Python Variables Python Basic Operators, Understanding python blocks.

Data Types: Declaring and using Numeric data types: int, float, complex using string data type and string operations, Use of Tuple data type.

UNIT- II (18 Hrs.)

Program Flow Control: Conditional blocks using if, else and elif, loops in python programming, continue, break statements in python.

UNIT- III (19 Hrs.)

Functions Modules and Packages: Organizing python codes using functions, organizing python projects into modules, Importing own module as well as external modules.

String List and Dictionary Manipulations: Building blocks of python programs, understanding string in build methods, List manipulation using in build methods, Dictionary manipulation Programming using string, list and dictionary in build functions.

UNIT- IV (19 Hrs.)

File Operation: Reading config files in python Writing log files in python Understanding read functions, read (), read line () and read lines () Understanding write functions, write () and writelines () Manipulating file pointer using seek Programming using file operations.

Recommended Books:

1. Sheetal Taneja Naveen Kumar, " Python Programming: A Modular Approach, by Pearson, **2017.**
2. Downey, Allen B. Think Python: How to Think Like a Computer Scientist (Version 1.6.6 Ed.), **2012.**
3. Hamilton, Naomi. "The A-Z of Programming Languages: Python", **2008.**
4. Lutz, Mark Learning Python (5th ed.). O'Reilly Media, **2013.**
5. Pilgrim, Mark Dive into Python 3. Apress, **2009.**

DATA ANALYTICS

Subject Code: - MSCCS1-404

**L T P C
4 1 0 5**

Duration: 75 Hrs.

UNIT-I (19 Hrs.)

Descriptive Statistics: Introduction to the course Descriptive Statistics, Probability Distributions.

Inferential Statistics: Inferential Statistics through hypothesis tests, Permutation & Randomization Test.

UNIT- II (18 Hrs.)

Regression & ANOVA: Regression ANOVA (Analysis of Variance)

Machine Learning: Introduction and Concepts Differentiating algorithmic and model based frameworks Regression : Ordinary Least Squares, Ridge Regression, Lasso Regression, K Nearest Neighbours Regression & Classification.

UNIT- III (19 Hrs.)

Supervised Learning with Regression and Classification techniques -1 Bias-Variance Dichotomy Model ,Validation Approaches Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Regression and Classification Trees Support, Vector Machines.

Supervised Learning with Regression and Classification techniques -2 Ensemble Methods: Random Forest ,Neural Networks, Deep learning.

UNIT- IV (19 Hrs.)

Unsupervised Learning and Challenges for Big Data Analytics: Clustering Associative, Rule Mining ,Challenges for big data analytics.

Prescriptive analytics: Creating data for analytics through designed experiments ,Creating data for analytics through Active learning ,Creating data for analytics through Reinforcement learning.

Recommended Books:

1. Hastie, Trevor, et al. The elements of statistical learning. Vol. 2. No. 1. New York: springer, 2009.
2. Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010.

SOFTWARE LAB VII(BASED ON MCAP3-421)

Subject Code: - MSCCS1-405

L T P C

0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper MCAP3- 421 Programming with Python. Students are required to develop programs in python language. Few programs are listed below:

1. To Exchange the Values of Two Numbers Without Using a Temporary Variable.
2. To Check if a Number is a Palindrome
3. To Print all Integers that Aren't Divisible by Either 2 or 3 and Lie between 1 and 50
4. To Print Table of a Given Number
5. To Print Sum of Negative Numbers, Positive Even Numbers and Positive Odd numbers in a List
6. To Print Numbers in a Range (1, upper) Without Using any Loops
7. To Find the Sum of Sine Series
8. To Find the Sum of First N Natural Numbers
9. To Search the Number of Times a Particular Number Occurs in a List
10. To Find the Largest Number in a List
11. To Find the Second Largest Number in a List
12. To Find the Second Largest Number in a List Using Bubble Sort
13. To Sort a List According to the Length of the Elements
14. To Sort a List of Tuples in Increasing Order by the Last Element in Each Tuple.
15. To Swap the First and Last Value of a List.
16. To remove the ith Occurrence of the Given Word in a List where Words can repeat.