

Sri Sri University



FACULTY OF SCIENCE

DOCS-Department of Computer Science

Two Year MCA (2020-22) LOCF Based

Semester	Lectures per Week	Course Credits	Marks
1 st Semester	28	26	800
2 nd Semester	28	26	800
3 rd Semester	30	30	1000
4 th Semester	40	40	1000
Total		Course Credits - 100	3600

AEC- Ability Enhancement Compulsory, **CC** - Core Course, **CCP** -Core Course Practical, **GE**- Generic Elective,

GEP- Generic Elective Practical, **SEC**- Skill Enhancement Course, **SECP**- Skill Enhancement Course Practical,

DSE – Discipline Specific Elective, **DSEP** – Discipline Specific Elective Practical

Preamble

Education is the key to development of any society. Role of higher education is crucial for securing right kind of employment and also to pursue further studies in best available world class institutes elsewhere within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Sustained initiatives are required to reform the present higher education system for improving and upgrading the academic resources and learning environments by raising the quality of teaching and standards of achievements in learning outcomes in undergraduate program in professional streams of higher education like computer science. One of the significant reforms in the postgraduate education is to introduce the Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the country which will help the students to ensure similar quality of education irrespective of the institute and location. With initiatives of University Grants Commission (UGC) for nation-wide adoption and implementation of the LOCF for PG programmes in colleges, universities and HEIs in general. So Two Year MCA at Sri Sri University is designed as per LOCF & as per UGC guidelines.

The main objective of Two Year MCA program at Sri Sri University is to prepare a comprehensive course structure with detailed syllabus along with quality reading material in order to have a uniform standard of education in undergraduate Computer Science programme among students. This document shall serve as a model document across the higher education institutes (HEIs) in the country for teachers, students and academic administrators. It is a student centric framework where they are expected to learn fundamentals of computer science along with the latest trends and techniques like Artificial Intelligence, Internet of Things, Machine Intelligence, Cloud Computing alongwith advanced skillsets that include Mobile Application Development, Object Oriented Programming among many other courses. It will help the students to be equipped with fundamental as well as advanced and latest technologies in computer science after completion of the programme

Introduction

MCA has been evolving as an important branch of science and engineering throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Computer science is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Computer Science can be seen on a higher level, as a science of problem solving and problem

solving requires precision, creativity, and careful reasoning. The ever-evolving discipline of computer science also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain.

MCA has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence, Computational Science, and Software Engineering. Drawing from a common core of computer science knowledge, each specialty area focuses on specific challenges. Computer Science is practised by mathematicians, scientists and engineers. Mathematics, the origins of Computer Science, provides reason and logic. Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

MCA will commence at Sri Sri University in this year 2020, as this discipline evolved itself to a multidisciplinary discipline. Information Technology is growing rapidly. Increasing applications of computers in almost all areas of human endeavor has led to vibrant industries with concurrent rapid change in technology. Unlike other basic disciplines, developing core competency in this discipline that can be reasonably stable becomes a challenge.

Career Objective

Two Year MCA is aimed at postgraduate level training facilitating multiple career paths. Students so graduated, can take up postgraduate programmes in CS leading to research as well as R&D, can be employable at IT industries, or can pursue a teachers' training programme such BEd in Computer Education, or can adopt a business management career. . There are several employment opportunities and after successful completion of an MCA. Graduating students can fetch employment directly in companies as Web Developer, Software Engineer, Network Administrator, Data Scientist, or AI/ML personnel, system administrator etc.

The Learning Outcome-based Curriculum Framework in MCA is aimed at allowing flexibility and innovation in design and development of course content, in method of imparting training, in teaching learning process and in assessment procedures of the learning outcomes. The emphasis in computer science courses, in outcome-based curriculum framework, help students learn solving problems, accomplishing IT tasks, and expressing creativity, both individually and collaboratively. The proposed framework will help Students learn programming techniques and the syntax of one or more programming languages.

Many of the learning outcomes of MCA can be achieved only by programming a computer for several different meaningful purposes. All students must, therefore, have access to a computer with a modern programming language installed. The computer science framework does not prescribe a specific language. The teacher and students will decide which modern programming languages students will learn. More importantly, students will learn to adapt to changes in programming languages and learn new languages as they are developed.

The present Learning Outcome-based Curriculum Framework for MCA is intended to facilitate the students to achieve the following.

- 1.To develop an understanding and knowledge of the basic theory of Computer Science and Information Technology with good foundation on theory, systems and applications such as algorithms, data structures, data handling, data communication and computation.
- 2.To develop the ability to use this knowledge to analyse new situations
- 3.To acquire necessary and state-of-the-art skills to take up industry challenges. The objectives and outcomes are carefully designed to suit to the above-mentioned purpose.
- 4.The ability to synthesize the acquired knowledge, understanding and experience for a better and improved comprehension of the real-life problems
- 5.To learn skills and tools like mathematics, statistics, physics and electronics to find the solution, interpret the results and make predictions for the future developments.

Curriculum Planning- Learning Outcomes-based Approach for MCA

MCA in India is generally a two-year degree program which develops advanced theoretical and research skills in subject . It is an appropriate course for students who wish to pursue Mphil(CS) or Doctor of Philosophy (PhD) in CS and a research or academic career. This program facilitates students who wish to pursue an independent research project in an area of interest under the supervision of an academic.

Aims of MCA Programmes

The MCA emphasizes problem solving in the context of algorithm development and software implementation and prepares students for effectively using modern computer systems in various applications. The curriculum provides required computer science courses such as programming languages, data structures, computer architecture and organization, algorithms, database systems, operating systems, and software engineering; as well as elective courses in artificial intelligence, computer-based communication networks, distributed computing, information security, graphics, human-computer interaction, multimedia, scientific computing, web technology, and other current topics in computer science. The main aim of this Master degree is to deliver a modern curriculum that will equip graduates with strong theoretical and practical backgrounds to enable them to excel in the workplace and to be lifelong learners. The purpose of the MCA programs in computer science are twofold: (1) to prepare the student for a position involving the design, development and implementation of computer software/hardware, and (2) to prepare the student for entry into a Research field.

MCA focus on the concepts and techniques used in the design and development of software systems. Students in this program explore the conceptual underpinnings of Computer Science -- its fundamental algorithms, programming languages, operating systems, and software engineering techniques. In addition, students choose from a rich set of electives that includes data science, computer graphics, artificial intelligence, database systems, computer architecture, and computer networks, among other topics. A generous allotment of free electives allows students to combine study in computer science with study in auxiliary fields to formulate a program that combines experiences across disciplines.

Programme Learning Outcomes for MCA

The MCA program enables students to attain, by the time of completion :

PLO-A. Demonstrate the aptitude of Computer Programming and Computer based problem solving skills.

PLO-B. Display the knowledge of appropriate theory, practices and tools for the specification, design, implementation

PLO-C. Ability to learn and acquire knowledge through online courses available at different MOOC Providers.

PLO-D. Ability to link knowledge of Computer Science with other two chosen auxiliary disciplines of study.

PLO-E. Display ethical code of conduct in usage of Internet and Cyber systems.

PLO-F. Ability to pursue higher studies of specialization and to take up technical employment.

PLO-G. Ability to formulate, to model, to design solutions, procedure and to use software tools to solve real world problems and evaluate .

PLO-H. Ability to operate, manage, deploy, configure computer network, hardware, software operation of an organization.

PLO-I. Ability to present result using different presentation tools.

PLO-J. Ability to appreciate emerging technologies and tools.

PLO-K. Apply standard Software Engineering practices and strategies in real-time software project development

PLO-L. Design and develop computer programs/computer -based systems in the areas related to algorithms, networking, web design, cloud computing, IoT and data analytics.

PLO-M. Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems

PLO-N. The ability to apply the knowledge and understanding noted above to the analysis of a given information handling problem.

PLO-O. The ability to work independently on a substantial software project and as an effective team member.

Two Years MCA 2021-23

Course Structure & Syllabus

MCA

Semester-I

Subject Code	Subjects Name	Contact Hours per Week		Credits			Examination Scheme			
		L	P	L	P	Total	Internal Assessment	Theory	Prac	Total
MCA101	Design Analysis and Algorithms	4		4		4	40	60		100
MCA102	Database Management System (DBMS)	4		4		4	40	60		100
MCA103	Computer Networks	4		4		4	40	60		100
MCA104	Cloud Computing	4		4		4	40	60		100
MCA105	Optimization Techniques	4		4		4	40	60		100
MCA106	DAA - LAB		2X2=4		2	2	40	--	60	100
MCA107	DBMS - LAB		2X2=4		2	2	40	--	60	100
MCA108	Minor project				2	2	40		60	100
Total		20	8	20	6	26	320	300	180	800
Total Contact Hours per Week=28 Total Credits=26 Total Marks = 800										

MCA

Semester-II

Subject Code	Subjects Name	Contact Hours per Week		Credits			Examination Scheme			
		L	P	L	P	Total	Internal Assessment	Theory	Prac	Total
MCA201	Programming with Java	4		4		4	40	60		100
MCA202	Computer Graphics and Multimedia	4		4		4	40	60		100
MCA203	Object oriented Software Engineering	4		4		4	40	60		100
MCA204	Elective – I	4		4		4	40	60		100
MCA205	Compiler Design & Language Processor	4		4		4	40	60		100
MCA206	Java –LAB		2X2=4		2	2	40	--	60	100
MCA207	CGM- LAB		2X2=4		2	2	40	--	60	100
MCA208	Group Discussion/Seminar				2	2	40		60	100
Total		20	8	20	6	26	320	300	180	800

Total Contact Hours per Week=28

Total Credits=26 Total Marks = 800

Elective – I (Choose any one)

1. MCA 204A: Embedded System
2. MCA 204B: Data Mining and Analysis/ Data Mining Techniques
3. MCA 204C: Wireless Communication and Mobile Computing
4. MCA 204D: ERP and E-commerce
5. MCA 204E: PHP and My SQL

MCA

Semester-III

Subject Code	Subjects Name	Contact Hours per Week		Credits			Examination Scheme			
		L	P	L	P	Total	Internal Assessment	Theory	Prac	Total
MCA301	Artificial Intelligence & Expert System	4		4		4	40	60		100
MCA302	Python Programming	4		4		4	40	60		100
MCA303	Business Information System	4		4		4	40	60		100
MCA304	Elective – II	4		4		4	40	60		100
MCA305	Elective – III	4		4		4	40	60		100
MCA306	Elective – IV(Open)	4		4		4	40	60		100
MCA307	Artificial Intelligence & Expert System LAB		2		2	2	40	--	60	100
MCA308	Python Programming-LAB		2		2	2	40	-	60	100
MCA309	Minor in-house Project and Viva		2		2	1	40	--	60	100
MCA310	Summer Internship Evaluation					1			100	100
Total		24	6	24	4	30	360	360	280	1000
Total Contact Hours per Week=30		Total Credits=30			Total Marks = 1000					

Elective-II (Choose any one)

1. MCA 305A: Cryptography and Cyber Law
2. MCA 305B: Information Security and Management
3. MCA 305C: Parallel Computing
4. MCA 305D: Business Analytics and Big Data
5. MCA 305E: Dot Net Programming

Elective-III (Choose any one)

1. MCA 306A: Distributed System / Advanced Operating System
2. MCA 306B Cloud Computing
3. MCA 306C: Microprocessor & Assembly Level Language Programming
4. MCA 306D: Foundations of Natural Processing (NLP)
5. MCA 306E: Soft Computing

Elective-IV (Open -Choose any one)

1. MCA 307A: Internet of Things
2. MCA 307B: Entrepreneurship Development
3. MCA 307C: Marketing Management
4. MCA 307D: Environmental Engineering
5. MCA 307E: Software Testing
6. MCA 307F: Open Source Technology
7. MCA 307G: E-Governance and Practice
8. MCA 307H: Mobile Application Development

MCA

Semester-IV

Subject Code	Subjects Name	Contact Hours per Week		Credits		Examination Scheme			
		L	P		Total	Evaluation by the Industry	Evaluation by the Institute (Report & Institute Viva)	Prac	Total
MCA401	Industrial Training cum Project/ Entrepreneurship Training cum Project	30	10		40	500	500		1000
Total Contact Hours per Week=40				Total Credits=40		Total Marks = 1000			

MCA FIRST SEMESTER

MCA 101 Design Analysis and Algorithms

Module 1 (10 Hours)

INTRODUCTION

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms. Amortized Analysis.

Module 2(10 Hours)

BRUTE FORCE AND DIVIDE-AND-CONQUER

Brute Force – Closest-Pair and Convex-Hull Problems-Exhaustive Search – Traveling Salesman Problem – Knapsack Problem – Assignment problem. Divide and conquer methodology – Merge sort –Heap Sort- Quick sort – Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication-Closest-Pair and Convex-Hull Problems.

Module 3(10 Hours)

DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE

Computing a Binomial Coefficient – Warshall's and Floyd's algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees.

Module 4 (10 Hours)

ITERATIVE IMPROVEMENT

The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs-the Stable marriage Problem.

COPING WITH THE LIMITATIONS OF ALGORITHM POWER

Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NPComplete Problems–Coping with the Limitations – Backtracking – n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem- Approximation Algorithms for NP – Hard Problems – Traveling Salesman problem – Knapsack problem.

Module 5 (6 Hours)

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.
2. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2012.

REFERENCES:

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
2. Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008
3. <http://nptel.ac.in/>

MCA-102 Database Management System (DBMS)

Module1 :(10Hours)

Introductory concepts of DBMS:

Introduction and applications of DBMS, Purpose of data base, Data, Independence, Database System architecture- levels, Mappings, Database, users and DBA

Relational Model:

Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, tuple relational calculus

Module2: (16 Hours)

Entity-Relationship model:

Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features – generalization, specialization, aggregation, reduction to E-R database schema.

Relational Database design:

Functional Dependency – definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization – 1NF, 2NF, 3NF, Decomposition using FD-dependency preservation, BCNF, Multi- valued dependency, 4NF, Join dependency and 5NF.

Module3: (10 Hours)

Query Processing & Query Optimization:

Overview, measures of query cost, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans, materialized views

Transaction Management:

Transaction concepts, properties of transactions, serializability of transactions, testing for serializability, System recovery, Two- Phase Commit protocol, Recovery and Atomicity, Log-based recovery, concurrent executions of transactions and related problems, Locking mechanism, solution to concurrency related problems, deadlock, , two-phase locking protocol, Isolation, Intent locking

Module 4 (10 Hours) Security:

Introduction, Discretionary access control, Mandatory Access Control, Data Encryption **SQL Concepts:**

Basics of SQL, DDL,DML,DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. transaction control commands – Commit, Rollback, Savepoint Distributed Data Base concepts.

PL/SQL Concepts:

Cursors, Stored Procedures, Stored Function, Database Triggers

Module 5 (6 Hours)

(As per choice of faculty)

(Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, “Database Systems Concepts”, McGraw-Hill Education , New Delhi
2. RamezElmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, Pearson Education Inc., New Delhi. **Reference Books:**

1. Hector Garcia-Molina, Jeffret D. Ullman, JennifferWidom, “Database Systems: A Complete Book”, Pearson Education Inc., New Delhi.
2. C. J. Date “An introduction to Database System”, Pearson Education Inc., New Delhi.
3. Bipin Desai, “An introduction to Database System”, Galgotia Publications.
4. Peter Rob & Carlos Coronel, “Database Systems: Design, Implementation, and Management”, CENGAGE Learning India Pvt. Ltd., New Delhi.
5. Mark L. Gillenson, “Fundamentals of Database Management Systems”, Wiley India Pvt. Ltd., New delhi.
6. Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, McGraw-Hill Education (India), New Delhi.

MCA 103 Computer Networks

Module 1 (10 Hours)

Network architecture – layers – Physical links – Channel access on links – Hybrid multiple accesstechniques - Issues in the data link layer - Framing – Error correction and detection – Link-level FlowControl

Module 2 (10 Hours)

Medium access – CSMA – Ethernet – Token ring – FDDI - Wireless LAN – Bridges andSwitches,Circuit switching vs. packet switching / Packet switched networks – IP – ARP – RARP – DHCP – ICMP –Queueing discipline – Routing algorithms –

RIP – OSPF – Subnetting– CIDR – Interdomain routing – BGP – Ipv6 – Multicasting – Congestion avoidance in network layer

Module 3 (10 Hours)

UDP – TCP – Adaptive Flow Control – Adaptive Retransmission -Congestion control – Congestion avoidance – QoS

Module 4 (10 Hours)

Email (SMTP, MIME, IMAP, POP3) – HTTP – DNS- SNMP – Telnet – FTP –Security – PGP - SSH

Module 5 (6 Hours)

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination) Preferably use of NetSim, NS2

TEXT BOOK :

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Third Edition, Morgan Kaufmann Publishers Inc., 2003.

REFERENCES:

1. James F. Kuross, Keith W. Ross, “Computer Networking, A Top Down Approach Featuring the Internet”, Third Edition, Addison Wesley, 2004.
2. Nader F. Mir, “Computer and Communication Networks”, Pearson Education, 2007
3. Comer, “Computer Networks and Internets with Internet Applications”, Fourth Edition, Pearson Education, 2003.
4. Andrew S. Tanenbaum, “Computer Networks”, Fourth Edition, 2003.
5. William Stallings, “Data and Computer Communication”, Sixth Edition, Pearson Education, 2000

MCA 104 Cloud Computing

Module 1 (10 Hours)

Overview of Computing Paradigm: Recent trends in Computing : Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. Introduction to Cloud Computing: Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing

Module 2 (10 Hours)

Cloud Computing Architecture: Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models-Infrastructure as a Service (IaaS), Platform as a

Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment , Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.

Module 3 (10 Hours)

Case Studies: Case Study of Service, Model using Google App Engine Microsoft Azure, Amazon EC2.

Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of Scaling.

Module 4 (10 Hours)

Cloud Security: Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in Cloud Computing.

Module 5 (6 Hours)

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination) Preferably use of NIST Architecture & SPI Model

TEXT BOOK :

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010
2. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, "Cloud
3. Computing Principles & Paradigms", Wiley-2011.
4. Cloud computing for dummies, wiley publication

MCA105 OPTIMIZATION TECHNIQUES

UNIT-I

Basics of idea of optimization of a function: Extremizer of function of single variable, and several variables, local minimizer and global minimizer of functions. Concept of critical points. feasible regions, convex region. Constrained optimization, unconstrained optimization. Introduction to linear programming problem(lpp). Formulation of lpp. Basic feasible solution of set of linear constraints. Determination feasible solutions of lpp with two variables by graphical method, use of iso-profit line. Different forms of lpp, standard form and canonical form.

UNIT-II

Solution of linear programming problem : Solution of lpp by simplex method, use of artificial variable in solving lpp. Identifying initial basic feasible solution, solution of lpp by Big-M method, and by two phase method. Duality in lpp , general rule for converting primal lpp to its dual. Dual simplex method is solving special types of lpp. Duality theorems (discussions on statements only), duality techniques in solving lpp.

UNIT-III

Special types of lpp : Introduction to transportation problem(TP) as an lpp. Solution of transportation problem: searching initial basic feasible solution of transportation problem by Vogel's method, test for

optimality in TP, improving feasible solution for optimality, optimal solution of TP by MODI method. Degeneracy in TP. Introduction to assignment problem as special type of TP, solution of assignment problem by Konig's algorithm. Special type of assignment problem prohibited assignment and traveling sales man problem.

UNIT-IV

Network Scheduling Problem: Introduction to network scheduling problem, Network and basic components, rules of network construction. Network scheduling by Critical Path Method (CPM) and Program Evaluation and Review method, distinction between CPM and PERT method.

UNIT-V

Non Linear Programming : One dimensional optimization, unimodal functions and its minimizer, optimization of unimodal functions by function comparison methods-two point equal search method, bisection method, golden section method; polynomial interpolation methods- quadratic interpretation, cubic interpretation; iterative methods- Newton's method, secant method. Unconstrained gradient based optimizations; method of steepest descent method, conjugate gradient method, Newton type method. Constrained optimization of non linear functions in function of several variables- Lagrange multipliers method, optimization by using Khun-Tucker conditions.

Recommended Books:

1. Operations Research, K. Swarup, P. K. Gupta, M. Mohan, Sultan Chand & sons, New Delhi, 1990.
2. Optimization : Theory and Practice, M. C. Joshi, K. M. Moudgalya, Narosa Publishing House.
3. Optimization Techniques: An Introduction, L. R. Foulds, Springer-Verlag.
4. Optimization Techniques, Chander Mohan and Kusum Deep, New Age Science.
5. Operation Research : An Introduction, H. A Taha, Mc Millan Publishing Co, New York, 1986.

MCA 107 Minor Projects

Small project on MapReduce, Maple, NetSim, NS2

MCA SECOND SEMESTER

MCA 201 Programming with Java

Module 1 (10 Hours)

Features of Java, Data types, operators & expressions, control structures, arrays, Classes, objects & methods, constructors, garbage collection, access qualifiers, string handling – string operations, character extraction, string comparison, searching and modifying strings, String Buffer, packages and interfaces, Wrapper classes.

Module 2 (10 Hours)

Inheritance: single and multilevel inheritance, method overriding, abstract class, use of super and final keywords. Exception Handling: Exception types, uncaught exceptions, multiple catch clauses, nested try statements, built-in exceptions, creating your own exceptions. Multithreading: Java thread model, creating multiple threads, thread priorities, synchronization, interthread communication, suspending, resuming and stopping threads.

Module 3 (10 Hours)

Applets: Local & Remote Applets, Applet Architecture, Passing Parameters to Applets, Applet Graphics, Adapter Class. I/O Streams: Console I/O – reading console input, writing console output, Files I/O – Byte Streams, Character Streams, Collection Interfaces & Classes, Delegation Event Model

Module 4 (10 Hours)

AWT Classes: Window fundamentals, working with graphics, working with color & fonts. AWT controls, layout managers & working with menus, JFrames. Swing Classes, Java Beans, Servlet classes & Life Cycle.

Module 5 (6 Hours)

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:

- 1. Herbert Schildt, The Complete Reference Java 2, Fourth Edition, Tata McGraw Hill-2001**
- 2. Liang Y.Daniel, Introduction to Java Programming (7th Edition), 2009, Pearson Education.**

Reference Books:

- 1.Steven Holzner, Java 1.2, BPB-1998
- 2.E. Balaguruswami, Programming with Java - Second Edition, Tata McGraw Hill1998.
- 3.Mughal K.A., Rasmussen R.W., A Programmer"s Guide to Java Certification,

MCA 202 Computer Graphics and Multimedia

Module 1 (10 Hours)

An Introduction Graphics System : Computer Graphics and Its Types, Application of computer graphics, Graphics Systems : Video Display Devices, Raster Scan Systems, Random Scan Systems, Graphics Monitors and Work Stations, Input Devices, Hard Copy Devices, Graphics Software.

Module 2 (10 Hours)

Output Primitives and Attributes of Output Primitives : Output Primitive Points and Lines, Line Drawing Algorithms, Circle Generating Algorithms, Scan-Line Polygon Fill Algorithm, Inside-Outside tests, Boundary-Fill Algorithm, Flood Fill Algorithm, Cell Array, Character Generation, Attributes of Output Primitives : Line Attributes, Color and Grayscale Levels, Area fill Attributes, Character Attributes, Bundled Attributes, Antialiasing.

Module 3 (10 Hours)

Two-dimensional Geometric Transformations : Basic Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing. Two-Dimension Viewing : The viewing Pipeline, Window to view port coordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping, Text Clipping, Exterior Clipping Three-Dimensional Concepts : Three Dimensional Display Methods, 3D Transformations, Parallel Proection and Perspective Projection.

Module 4 (10 Hours)

Multimedia : Introduction to Multimedia : Classification of Multimedia, Multimedia Software, Components of Multimedia – Audio : Analog to Digital conversion, sound card fundamentals, Audio play backing and recording Video, Text : Hypertext, Hyper media and Hyper Graphics, Graphics and Animation : Classification of Animation. Authoring Process and Tools. Case Study: graphics software MatLab, Use of MatLab in graphics application, Features of MatLab, Generalize application by using MatLab.

Module 5 (6 Hours)

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:

1. Donald **Hearn** & M. Pauline **Baker**, “*Computer Graphics with OpenGL*”, Third Edition, 2004, Pearson Education, Inc. New Delhi.

2.Ze-NianLi and Mark S. Drew, "*Fundamentals of Multimedia*", First Edition, 2004, PHI Learning Pvt. Ltd., New Delhi.

Reference Books:

- 1.Plastock : Theory & Problem of Computer Gaphics, Schaum Series.
- 2.Foley & Van Dam : Fundamentals of Interactive Computer Graphics, AddisonWesley.
- 3.Newman : Principles of Interactive Computer Graphics, McGraw Hill.
- 4.Tosijasu, L.K. : Computer Graphics, Springer-Verleg.
- 5.S. Gokul : Multimedia Magic, BPB Publication.
- 6.Bufford : Multimedia Systems, Addison Wesley.
- 7.Jeffcoate : Multimedia in Practice, Prectice-Hall.
- 8.any other book(s) covering the contents of the paper in more depth.

Two Years MCA 2021-23

MCA 203 Object Oriented Software Engineering

Module 1 (10 Hours)

Software Process Models:

Software Product, Software crisis, Handling complexity through Abstraction and Decomposition, Overview of software development activities, Process Models, Classical waterfall model, iterative waterfall model, prototyping mode, evolutionary model, spiral model, RAD model, Agile models: Extreme Programming.

Module 2 (10 Hours)

Software Requirements Engineering:

Requirement Gathering and Analysis, Functional and Non-functional requirements, Software Requirement Specification (SRS), IEEE 830 guidelines, Decision tables and trees.

Software Project Management:

Responsibilities of a Software project manager, project planning, Metrics for project size estimation, Project estimation techniques, Empirical estimation techniques, COCOMO models, Scheduling, Organization & team structure, Staffing, Risk management, Software configuration management.

Module 3 (10 Hours)

Structured Analysis & Design:

Overview of design process: High-level and detailed design, Cohesion and coupling, Modularity and layering, Function-Oriented software design: Structured Analysis using DFD Structured Design using Structure Chart, Basic concepts of Object Oriented Analysis & Design. User interface design, Command language, menu and iconic interfaces.

Coding and Software Testing Techniques:

Coding, Code Review, documentation. Testing: - Unit testing, Black-box Testing, Whitebox testing, Cyclomatic complexity measure, coverage analysis, mutation testing, Debugging techniques, Integration testing, System testing, Regression testing.

Module 4 (10 Hours)

Software Reliability and Software Maintenance:

Basic concepts in software reliability, reliability measures, reliability growth modeling, Quality SEI CMM, Characteristics of software maintenance, software reverse engineering, software reengineering, software reuse.

Emerging Topics:

Client-Server Software Engineering, Service-oriented Architecture (SOA), Software as a Service (SaaS).

Module 5 (6 Hours)

(as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books:

1. Fundamentals of Software Engineering, Rajib Mall, PHI, 2014.
2. Software Engineering, A Practitioner"s Approach, Roger S. Pressman, TMG Hill.

Reference Books:

1. Software Engineering, I. Somerville, 9th Ed. , Pearson Education.

MCA 204D: ERP and E-commerce (ELECTIVE I)

UNIT-I

Introduction

What is E-Commerce, Forces behind E-Commerce Industry Framework, Brief history of E-Commerce, Inter Organizational E-Commerce Intra Organizational E-Commerce, and Consumer to Business Electronic Commerce, Architectural framework
Network Infrastructure for E-Commerce Network Infrastructure for E-Commerce, Market forces behind I Way, Component of I way Access Equipment, Global Information Distribution Network, Broad band Telecommunication.

UNIT-II

Mobile Commerce

Introduction to Mobile Commerce, Mobile Computing Application, Wireless Application Protocols, WAP Technology, Mobile Information Devices, Web Security
Introduction to Web security, Firewalls & Transaction Security, Client Server Network, Emerging Client Server Security Threats, firewalls & Network Security.

UNIT-III

Encryption

World Wide Web & Security, Encryption, Transaction security, Secret Key Encryption, Public Key Encryption, Virtual Private Network (VPM), Implementation Management Issues.

UNIT – IV

Electronic Payments

Overview of Electronics payments, Digital Token based Electronics payment System, SmartCards, Credit Card I Debit Card based EPS, Emerging financial Instruments, Home Banking, Online Banking.

UNIT-V

Net Commerce

EDA, EDI Application in Business, Legal requirement in E -Commerce, Introduction to supplyChain Management, CRM, issues in Customer Relationship Management.

Books:

1. Greenstein and Feinman, "E-Commerce", TMH
2. Ravi Kalakota, Andrew Whinston, "Frontiers of Electronic Commerce", Addison Wesley
3. Denieal Amor, " The E-Business Revolution", Addison Wesley
4. Diwan, Sharma, "E-Commerce" Excel
5. Bajaj & Nag, "E-Commerce: The Cutting Edge of Business", TMH

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MCA 205 Compiler Design and Language Processor

Module 1 (10 Hours)

Introduction to Compilers: Compilers and translators, Phases of compiler design, cross compiler, Bootstrapping, Design of Lexical analyser, LEX programming.

Syntax Analysis: Specification of syntax of programming languages using CFG, Topdown parser, design of LL (1) parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR, CLR parsers. YACC programming.

Module 2 (10 Hours)

Syntax directed translation: Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate notations: postfix, syntax tree, TAC, translation of expression, controls structures, declarations, procedure calls, Array reference.

Storage allocation & Error Handling: Run time storage administration, stack allocation, symbol table management, Error detection and recovery: lexical, syntactic, semantic.

Module 3(10 Hours)

Code optimization: Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, Loop invariant computation, Induction variable removal, Elimination of Common sub expression.

Module 4 (10 Hours)

Code generation – Problems in code generation, Simple code generator, Register allocation and assignment, Code generation from DAG, Peephole optimization.

Text Books:

- Compilers: Principles Techniques and Tools 1st edition by A. V. Aho, Sethi, Ullman, Pearson education.
- Principal of Compiler Design – Alfred V. Aho& Jeffery D. Ullman ,Narosa Pub. House.

Module 5 (6 Hours)

(As per choice of faculty)

(Portion covered can be tested through Internal evaluation only not to be included in University examination)

Text Books

1. Principles of Compiler Design by Alfred V. Aho., Jeffrey D. Ulman.
“Compilers: Principles, Techniques and Tools” Aho, Ravi Sethi, Ullman, Pearson Education, VIII Ed. 2002.

Reference Books

1. Lex and Yacc by Johan R. levine, Tonny Mason, et. al. O” Reilly and Associates.
“Compilers Design in C” Allen I. Holub, PHI eastern economy edition 2003.

MCA 208 Group Discussion/Seminar

Tasks:

Reading of newspapers, writing of articles, how to prepare seminars and reports, technical paper writing skills, GD on current topics, invited guest for spoken English, HR personnel from IT industries.

Note:10 things to succeed in Group Discussion

Read voraciously

Make a habit of reading voraciously on every subject. This will keep you ready for any topic for a discussion in GD Your knowledge is your most important weapon in a discussion.

Initiate the discussion

Most of us have a misconception that initiating the discussion would give you an advantage over others. It does give you an advantage but only if you know the subject well and have something relevant to start the discussion otherwise it is a disadvantage.

For e.g. when a group was given a subject "Is Capital punishment right?" some members of the group heard the word punishment and jumped at starting the discussion without understanding the meaning of Capital Punishment. The evaluators kept hearing for 2 minutes after which they intervened and asked the group if they knew the meaning of Capital Punishment. Not to say, the members who initiated were quite looking at each other's faces. That is when a quiet member of the group got up and explained the meaning of the topic. From this incidence, you can easily tell who must have succeeded in the GD, the ones who initiated the discussion or the one who explained the topic and gave it a right direction.

They say, "Speaking just for the sake of speaking is noise". So, don't create noise in the GD rather make some useful and resourceful contributions to get noticed in the discussion.

Speak politely and pleasantly

As you speak make sure that you do not speak at the top of your voice. You should be audible and clear. Remember that you are participating in a discussion which is different from a speech given out by the leaders in their rallies. Even if you disagree with the other's point of view, disagree politely. Use phrases like, I would like to disagree a bit here, I am sorry but I think I have a slightly different point of view here.

Be précised

Abstain from using irrelevant information and data from your talks during a GD Speak precisely so that others also get a chance to put across their point of view.

Acquire and apply knowledge

Stay attentive to the ideas put forward by other group members and keep writing the important points discussed during the GD As you get a chance to speak, put forward your views about the topic. You can also agree or disagree with other's ideas, based on your knowledge about the subject.

Agree with the right

Don't take a stand on either extreme when the discussion begins. It might happen that you get convinced by other's argument and want to change your stand.
Respect other's opinion as well and agree with what is right, even if you initially had a different opinion.

Speak confidently

Maintain your confidence as you speak. Establish eye contact with other members of the group and do not let your voice tremble.

Moderate

Try to moderate the discussion if any arguments arise. This is necessary to ensure that the group doesn't wander from the goal of the GD

Use positive body language

Your body language should not demonstrate dominance or low self-confidence. Show your interest in the discussion through your gestures like bending forward a bit, nodding your head.

Be a team player

Last but not the least; be a team player as this is a group activity. Be comfortable with the group members and vice versa.

Sample GD topics

- Reservation system should be stopped
- Donald Trump"s presidency – Impact on India bad or good
- Divorce and remarriage should be encouraged
- Reservation for women would help the society
- Hindi movies are harming our society
- Live-in relationships should be encouraged
- India should be reorganized into smaller states
- IT boom and the growing pressure
- Smaller businesses and start-ups have more scope
- Developing countries need trade, not aid → China is a threat to Indian IT industry
- Should agricultural subsidies be stopped?
- Multinational corporations: Are they devils in disguise?
- Business and Ethics do not go together
- India - really the NexGen superpower
- Fate of Apple after Steve Jobs
- FDI in Retail - Will really affect the farmers of India?
- EU Zone Crisis - reason for rising value of dollar
- US Debt Crisis - really has an impact on world market
- Should central government provide West Bengal a moratorium on loan repayments?
- Sanctions against Iran - right or wrong?
- FDI in Indian retail should be welcomed
- China market - a threat to Indian market
- Black money in tax heavens - declared national property → Rising petrol prices - Govt. can control? → Government should give up the control on CBI → US war on Iraq-justified or not?
- Depreciation of Indian Rupee has only negative impact on the economy → Nokia and Microsoft are a planned alliance or desperate move? → RBI cannot control inflation with its temporary monetary policies
- Ditching the Kyoto Protocol - Is India's objection on EU justified?

THIRD SEMESTER

MCA 301 Artificial Intelligence & Expert System

Module I

Introduction to AI, AI Problems and AI techniques, Solving problems by searching, Problem Formulation. Intelligent Agents: Structure of Intelligent agents, Types of Agents, Agent Environments .Uninformed Search Techniques: DFS, BFS, Uniform cost search, Depth Limited Search, Iterative Deepening, Bidirectional search, Comparing Different Techniques.

Module II

Informed Search Methods: Heuristic functions, Hill Climbing, Simulated Annealing, Best First Search, A*, IDA*, SMA*, Crypto-Arithmetic Problem, Backtracking for CSP, Performance Evaluation. Adversarial Search: Game Playing, Min-Max Search, Alpha Beta Pruning.

Module III

Knowledge and Reasoning: A Knowledge Based Agent, WUMPUS WORLD Environment, Propositional Logic, First Order Predicate Logic, Forward and Backward Chaining. Planning: Introduction to Planning, Planning with State Space Search, Partial Ordered planning, Hierarchical Planning, Conditional Planning, Planning with Operators.

Module IV

Uncertain Knowledge and Reasoning: Uncertainty, Representing Knowledge in an Uncertain Domain, Conditional Probability, Joint Probability, Bays theorem, Belief Networks, Simple Inference in Belief Networks. Learning: Learning from Observation, General Model of Learning Agents, Inductive Learning, Learning Decision Trees, Rote Learning, Learning by Advice, Learning in Problem Solving, Explanation based Learning. Expert Systems: Introduction, Design of Expert systems.

Books:

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 2nd Edition, Pearson Education.
2. Elaine Rich, Kevin Knight, Shivshankar B Nair, *Artificial Intelligence*, McGraw Hill, 3rd Edition.
3. Nils J. Nilsson, "*Artificial Intelligence: A New Synthesis*", 2nd Edition, 2000, Elsevier India Publications, New Delhi.
4. Michael Negnevitsky, "*Artificial Intelligence: A Guide to Intelligent Systems*", Second Edition, 2005, Pearson Education, Inc. New Delhi.
5. Dan W. Patterson, "*Introduction to Artificial Intelligence and Expert Systems*", 1st Edition, 1996, PHI Learning Pvt. Ltd., New Delhi.
6. Ben Coppin, "*Artificial Intelligence Illuminated*", 2005, Narosa Publication, New Delhi. ISBN: 978-81-7319-671-3

MCA 302 Python Programming

Module I

Overview of Computing Paradigm: Recent trends in Computing : Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. Introduction to Cloud Computing: Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing

Module II

Cloud Computing Architecture: Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models-Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, Deployment , Models- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.

Module III

Case Studies: Case Study of Service, Model using Google App Engine Microsoft Azure, Amazon EC2.

Service Management in Cloud Computing: Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of Scaling.

Module IV

Cloud Security: Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in Cloud Computing.

Recommended Books:

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010
2. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, "Cloud
3. Computing Principles & Paradigms", Wiley-2011.
4. Cloud computing for dummies, wiley publication

MCA 303 Business Information System

This course will give a high level understanding of what information is, what business is and how information is key to successful execution of a business. It will help understanding the evolution of information system from a traditional way of dealing with information to a level how information is a business enabler. It also covers the tools and techniques deployed to expedite the information processing and controlled dissemination of information.

Module 1(10 Hours)

Introduction to Business Information System: What is information and what is Business. Why information System, perspectives of information system, contemporary approaches to information system, Learning to use information system- key management issues.

Module 2 (10 Hours)

Information System in the enterprise: Major types of information system, systems from a functional perspective, integrating functions and business processes, Management opportunities, Challenges and Solutions

Module 3 (10 Hours)

Information systems, organizations, management and strategy: Organizations and information systems, how information system impact organizations and business firms, impact of IT on management decision making, management information system and business strategy, management opportunities challenges and solutions

Module 4(10 Hours)

The digital farm: Electronic Business and electronic commerce and digital farm, eCommerce, e-Business and digital farm, management opportunities, challenges and solutions, ethical and social issues in digital farm, ethics in an information society, moral dimensions of information system. IT infrastructure and Platforms: IT infrastructure, infrastructure component, contemporary hardware platform trend, contemporary software platform trends, organizing data in a traditional file environment, database approach to data management, Telecommunications, network and the internet, contemporary networking infrastructure, Internet, social media.

Module 5 (6 Hours) (as per choice of faculty)

Portion covered can be tested through Internal evaluation only not to be included in University examination)

MS Suit of products (Excel, Access, Power-point) covering information extraction using Scenarios, Pivot, Macros. Animated presentations, small scale database design and reporting.

References

1. Management Information Systems by Kenneth C Laudon- Prentice Hall.
2. Business Information Systems by Robert C Nickerson, Prentice Hall

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MCA304 (Elective-II)

Elective-II (Choose any one)

1. MCA 304A: Cryptography and Cyber Law
2. MCA 304B: Information Security and Management

3. MCA 304C: Parallel Computing
4. MCA 304D: Business Analytics and Big Data
5. MCA 304E: Dot Net Programming

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MCA305 (Elective-III)

Elective-III (Choose any one)

1. MCA 305A: Distributed System / Distributed Technology
2. MCA 305B Cloud Computing
3. MCA 305C: Microprocessor & Assembly Level Language Programming
4. MCA 305D: Foundations of Statistical Natural Processing (NLP)
5. MCA 305E: Soft Computing

MCA306 (Elective-IV)

Elective-IV (Open -Choose any one)

1. MCA 307A: Internet of Things
2. MCA 307B: Entrepreneurship Development
3. MCA 307C: Marketing Management
4. MCA 307D: Environmental Engineering
5. MCA 307E: Software Testing
6. MCA 307F: Open Source Technology
7. MCA 307G: E-Governance and Practice

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Eligibility for admission to MCA

1. B. Sc. Computer Science/B.Sc(Hons) Computer Science
2. B. Sc. ITM with Mathematics at +2 level,
3. BCA with Mathematics at +2 level
4. Btech(CSE)/Btech(IT)
5. Bsc(Hons) Data Science

With 50% marks

Examinations: As per University norms for MCA Courses.

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