S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assignmen ts /Seminar		
1	MCA - 301	**Computer Networks & Internet Protocol**	3	1	-	60	20	20	-	-	100	4

Unit-I: Introductory Concepts: Goals and Applications of Networks, Network structure and architecture, the OSI reference model, network services, networks topology: Bus, Star, Ring, Mesh, Tree, and Hybrid Topology. Delay Analysis, Back Bone Design, Local Access Network Design Physical Layer- transmission media: Guided, Unguided Twisted pair, Coaxial cable, Optical Fiber, switching methods: circuit, packet, Message Switching, Integrated services digital networks, terminal handling

Unit-II: Medium access sub layer: Channel allocations, LAN protocols, ALOHA Protocols- Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, , switched and fast Ethernet, token ring, FDDI, IEEE standards, Data Link Layer- basic design issues, error correction & detection algorithms, elementary data link layer protocols, sliding window protocols, error handling, High Level Data Link Control
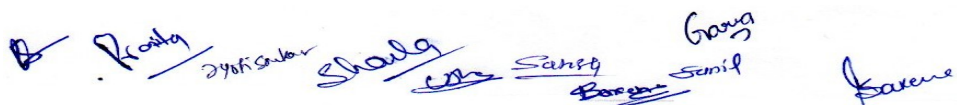
Unit-III: Network Layer: Point-to Point networks, concept of virtual circuit and LAN, Network routing, Routing Tables, Types of routing, Dijkstra's Algorithm, Bellman-Ford Algorithm, Link state routing, Open shortest path first, Flooding, Broadcasting, Multicasting, congestion, Congestion Detection, congestion control algorithms: The Leaky Bucket, The Token Bucket, Choke Packets, internetworking: Repeaters, Bridges, routers, gateways, IP addresses: IPv4, IPv6

Unit-IV: Transport Layer: Design issues, connection management session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography, Internet Transport Protocol (UDP), Ethernet transport Protocol, Transmission Control Protocol (TCP)

Unit-V: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Example Networks - Internet and Public Networks

Recommended Books: -
1. "Computer Networks" by A. S Tanenbaum, 5th Edition, Pearsoneducation,2013
2. "Data and Computer Communication" by W. Stallings, 8th Edition, Macmillan Press,2007
3. "Computer Networks & Internet with Internet Applications" by Comer 5th Edition, Pearson Education,2009

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assignmen ts /Seminar		
2	MCA-302	**Artificial Intellige nce & Machine Learning**	3	1	-	60	20	20	-	-	100	4

Unit I:Introduction and applications of artificial intelligence: Problem solving , Defining the problem as state space search, Production system, Problem characteristics, Problem system characteristics, Search techniques : Generate and test, Hill climbing, Best first Search, A* algorithm, Problem reduction, Introduction to LISP programming: Syntax and numeric functions, Basic list manipulation functions, predicates and conditionals, input output and local variables,iteration and recursion, property lists and arrays

Unit II:Expert system: Definition, Role of knowledge in expert system, Architecture of expert system, Expert system development life cycle: Problem selection, Prototype construction, Formalization, Implementation, Evaluation, Knowledge acquisition: Knowledge engineer, Cognitive behaviour, Acquisition techniques

Unit III:Knowledge representation: Level of representation, Weak Slot-and-Filler Structures: Semantic Nets Frames, Strong Slot-and Filler Structures: Conceptual Dependency, Scripts, CYC, Knowledge Representation Summary:Syntactic Semantic Spectrum of Representation, Logic and Slot-and-Filler Structures, Other Representational Techniques, Summary of the Role of Knowledge

Unit IV: Symbolic Reasoning under Uncertainty: Introduction to Nonmonotonic Reasoning, Logics for Non monotonic Reasoning, Implementation Issues, Augmenting a Problem solver, Implementation: Depth-First Search, Implementation: Breadth_First Search. Statstical Reasoning: - Probability and Baye's Theorem, Certainty Factors and Rule-Based Systems, Bayesian Networks, Dempster-Shafer Theory

Unit V: Introduction:Machine Learning - Machine Learning Foundations –Overview – Design of a Learning system - Types of machine learning. Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search. Supervised Learning:Linear Models for Regression - Linear Models for Classification – Naïve Bayes - Discriminant Functions -Probabilistic Generative Models -Probabilistic Discriminative Models - Bayesian Logistic Regression. Decision Trees - Classification Trees- egression Trees - Pruning. Neural Networks -Feed-forward Network Functions - Back propagation. Support vector machines - Ensemble methods- Bagging-Boosting

Recommended Books:

1. "Principles of Artificial Intelligence and Expert System Development" by David W. Rolston: McGraw Hill Book Company
2. "Artificial Intelligence" by Elaine Rich, Kevin Knight, Tata McGraw Hill, 2017
3. "Introduction to Machine Learning (Adaptive Computation and Machine Learning)" by Ethem Alpaydin, The MIT Press, 2004

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assignmen ts /Seminar		
3	MCA-303	**Analysis & Design of Algorithm**	3	1	-	60	20	20	-	-	100	4

Samrat Ashok Technological Institute Vidisha (M.P.)
M.C.A. Two Year Programme

Pre-requisites
- Math foundations: elementary set theory, concepts of relations and functions, mathematical induction
- Data structures & Algorithms.
- Programming languages: a general-purpose programming language.

Course Objectives:
A) Determine different time complexities of a given algorithm
B) Demonstrate algorithms using various design techniques.
C) Develop algorithms using various design techniques for a given problem.

COURSE CONTENTS

UNIT I:
Algorithms: Definition and characteristics. Analysis: Space and Time Complexity, Asymptotic Notations, Time Complexity Analysis of algorithms (Linear Search, Insertion Sort etc.)Recursive algorithms and recurrence relations. Solutions of recurrence relations.
Divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, quick sort,
merge sort, Heap Sort, Strassen's matrix multiplication with their complexity analysis.

UNIT II:
Greedy Algorithms: Knapsack problem, Job sequencing with deadlines, optimal merge patterns, Huffman coding, Dynamic Programming: Multistage Graph, all pairs shortest paths, 0-1 Knapsack, Chained matrix multiplication, Longest common subsequence, Travelling salesperson problem.

UNIT III:
Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms- Dijkstra's Algorithms and Complexity Analysis, Transitive closure, Minimum Spanning Tree- Prim's and Kruskal's Algorithm and their complexity analysis, Union Find Data Structure, Topological sorting, Network Flow Algorithm.

UNIT-IV:
Branch &Bound technique: Definition and application to solve 0/1 Knapsack Problem, 8-puzzle problem, travelling salesman problem.Back
tracking concept and its examples like 8 Queens's problem, Hamiltonian cycle, Graph Coloring problem.

UNIT-V:
Tractable and Intractable Problems: Computability of Algorithms- P, NP, NP-complete and NP-hard. Introduction to Approximation Algorithms, NP-complete problems and Reduction techniques. Lower bound theory and its use in solving algebraic problem.

Reference Books:

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, "Introduction to Algorithms", PHI, 3rd edition, ISBN-13: 978-8120340077
2. Ellis Horowitz, Sartaj Sahni and SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2nd edition (2008), ISBN-13: 978-8173716126
3. Gilles Brassard and Paul Bratley, "Fundamentals of Algorithmics", PHI, ISBN-13: 978- 8120311312

Course Outcomes: The students would be able to

CO1: Analyse and justify the running time complexity of algorithms

CO2: Articulate the effectiveness of divide and conquer methods to solve searching, sorting and other problems.

CO3: Understand the combinatorial problems andjustify the use of Greedy and Dynamic Programming techniques to solve them.

CO4: Model graph or tree **f**or a given engineering problem, and write the corresponding algorithm to solve it.

CO-5: Able to analyse the NP-complete

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mid Sem.	Assignments/ Quiz	End Sem. Practical Viva	Practical records/Assignments /Seminar		
4	**MCA- 304 Elective II(a)**	**Cloud Computing**	3	1	-	60	20	20	-	-	100	4

Unit-I: Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Comparison among SAAS, PAAS, IAAS Cloud computing platforms: Infrastructure as service: Amazon EC2, Platform as Service, Microsoft Azure, Utility Computing, Elastic Computing, Understanding Windows Azure Platform Architecture

Unit-II: Introduction to Cloud Technologies, Study of Hypervisors Compare SOAP and REST Webservices, AJAX and mashups-Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services Virtualization Technology: Virtual machine technology, Multi-entity support, Multi-schema approach **Unit-III: Data in the cloud:** Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. Map Reduce and extensions: Parallel computing, the map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Enterprise batch processing using Map-Reduce, Introduction to cloud development, Example/Application of Map Reduce, Features and comparisons among GFS, HDFS etc, Map-Reduce model

Unit-IV: Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud Cloud computing security architecture, Identity Management and Access control Identity management, Access control, Cloud computing security challenges: Secure Execution Environments and Communications in cloud

Unit-V: Issues in cloud computing, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment. Cloud Middleware. Mobile Cloud Computing load balancing, resource optimization, resource dynamic reconfiguration, monitoring in Cloud, Cloud computing platforms, Installing cloud platforms and performance evaluation Features and functions of cloud platforms: Xen Cloud Platform, Eucalyptus, OpenNebula, Elastic Computing Platform

Recommended Books:

1. "Cloud Computing for Dummies" by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper , Wiley India Edition, 2010 2. "Cloud Security & Privacy" by Tim Malhar, S.Kumaraswammy, S.Latif, S P D , O ' R E I L L Y , 2009 3. "Cloud Computing: A Practical Approach" by Antohy T Velte, et.al McGraw Hill, 2010

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mid Sem.	Assignments/ Quiz	End Sem. Practical Viva	Practical records/Assignments /Seminar		
5	**MCA- 304 Elective II(b)**	**Internet of Things(IoT)**	3	1	-	60	20	20	-	-	100	4

Unit-I: Introduction: Definition, Characteristics of IoT, IoT Conceptual framework, IoT Architectural view, Physical design of IoT, Logical design of IoT, Application of IoT. Machine-to-machine (M2M), SDN (software defined networking) and NFV (network function virtualization) for IoT, data storage in IoT, IoT Cloud Based Services

Unit-II: Design Principles for Web Connectivity: Web Communication Protocols for connected devices, Message Communication Protocols for connected devices, SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IoT, Media Access control
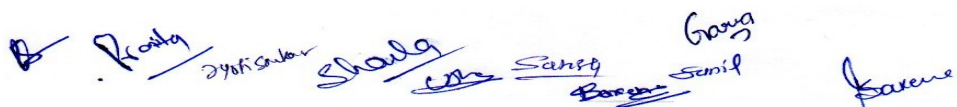
Unit-III: Sensor Technology, Participatory Sensing, Industrial IoT and Automotive IoT, Actuator, Sensor data Communication Protocols, Radio Frequency Identification Technology, Wireless Sensor Network Technology

Unit-IV: IoT Design methodology: Specification -Requirement, process, model, service, functional & operational view, IoT Privacy and security solutions, Raspberry Pi & arduino devices. IoT Case studies: smart city streetlights control & monitoring

Unit-V: Internet of Everything: what is IoE, Features of IoE, How it actually works, difference between IoT & IoE, Benefits of IoE

Recommended Books:

1. "Internet of Things: Architecture Design Principle and Applications" by Rajkamal, Tata McGraw Hill publication, 2016

2. "The Internet of Things: Connecting Objects to the web" by Hakima Chaouchi, Wiley publication, 2010 3. "Rethinking the Internet of things:A scalable Approach to connecting everything" by Francis dacosta 1st edition, Apress publications 2013

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assignmen ts /Seminar		
6	**MCA- 304 Elective II(c)**	**Soft Computing**	3	1	-	60	20	20	-	-	100	4

Samrat Ashok Technological Institute Vidisha (M.P.) / **M.C.A. Two Year Programme**

Unit-I: Introduction to soft computing, Applications of Artificial Neural Networks, fuzzy logic, genetic algorithms and other soft-computing techniques, Their strengths and weaknesses, Synergy of soft computingtechniques

Unit-II: Introduction to artificial neural network; Neural Networks: Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Competitive learning networks, Kohonen self organizing networks, Hebbian learning; Hopfield Networks

Unit-III: Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets,Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations

Unit-IV: Genetic algorithms (Gas), Evolution strategies (Ess), Evolutionary programming (EP), Genetic Programming (GP), Selecting, crossover, mutation, schema analysis, analysis of selection algorithms; convergence; Markov & other stochastic models

Unit-V: Statistical Pattern Recognition: classification and regression, Pre processing and feature extraction, polynomial curve fitting, Model complexity, Bayes' theorem & Techniques, Decision boundaries, minimizing risk, Probability density estimation, Other soft computing approaches Simulated Annealing, Tabu Search, Ant colony-based optimization, etc

Recommended Books:
1. "Introduction to the Theory of Neural Computation", by Hertz J. Krogh, R.G. Palmer, Addison-Wesley, California, 1991
2. "Neural Networks- A Comprehensive Foundations" by Prentice-Hall International, New Jersey, 1999 3. "Neural Networks, Fuzzy Logic, and Genetic Algorithms: Synthesis and applications" by S.Rajasekaran & G.A. Vijayalakshmi Pai, PHI learning Private Limited, 2010

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assignmen ts /Seminar		
7	**MCA- 304 Elective II(d)**	**Blockchain**	3	1	-	60	20	20	-	-	100	4

Samrat Ashok Technological Institute Vidisha (M.P.)
M.C.A. Two Year Programme

UNIT – I OVERVIEW OF BLOCKCHAIN:

Why Blockchain - The Structure of Blockchain - Data Structure of Blockchain - Data Distribution in Blockchain - Block Validation. Block Validators: Proof of Work – Proof of Stake - Proof of Activity - Proof of Elapsed Time - Proof of Burn.

UNIT – II CRYPTOCURRENCY

Overview. Bitcoin: Bitcoin Working - Bitcoin Transactions - Bitcoin Mining - Value of Bitcoin - Community, Politics and Regulations – Advantages – Disadvantages. Ethereum: Overview – Decentralized Application. Components of Ethereum: Smart contracts – Ether - Ethereum Clients - Ethereum Virtual Machine – Etherscripter.

UNIT – III- HYPERLEDGER

Introduction. Digital Tokens: Overview - Initial Coin Offering – OmiseGO – EOS – Tether. MetaMask: Wallet Seed - MetaMask Transactions. Mist: Overview - Mist wallet. Truffle: Features of Truffle – Development Truffle boxes - Community truffle box.

UNIT – IV SOLIDITY

Smart Contracts - Contract and Interfaces - Hyperledger Fabric: Introduction - Fabric v/s Ethereum - HyperledgerIroha - Features of Iroha. HyperledgerSawtooth: Components of sawtooth - Proof of Elapsed time.

UNIT – V BLOCKCHAIN PLATFORMS

Multichain - HydraChain. Future Blockchain: IOTA – Corda - Chain Core.Blockchain Framework: CoCo Framework – Tierion – BigchainDB

REFERENCES:
1. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
3. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015.
4. https://www.blockchainexpert.uk/book/blockchain-book.pdf

MOOC Website references (Example website references are only given; it's not an exhaustive list)
1. www.coursera.org
a. Blockchain and cryptocurrency explained
b. Blockchain revolution
c. Bitcoin and Cryptocurrency technologies
d. Blockchain basics
e. Introduction to Blockchain

f. Introduction to Blockchain technologies
g. Blockchain foundations and use cases

2. www.udemy.com
    a. Build a blockchain and cryptocurrency from scratch
    b. The Basics of Blockchain
    c. Blockchain advanced level

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assig nments /Seminar		
8	MCA- 304 Elective II(e)	Mobile Application Development	3	1	-	60	20	20	-	-	100	4

Samrat Ashok Technological Institute Vidisha (M.P.)
M.C.A. Two Year Programme

Course Objectives:

- To introduce the technology for mobile application development.
- To understand the framework for mobile application.

Course Outcomes:

- Students will be able to understand android for mobile application development
- Students will be able to design mobile application using framework

UNIT I
Introduction to Mobile Computing, Factors in Developing Mobile Applications, Mobile Software Engineering Frameworks and Tools.

UNIT II
Mobile Application Design: Application Model and Infrastructure, Hardware and Software Architecture Mobile development Environment and Software.

UNIT III

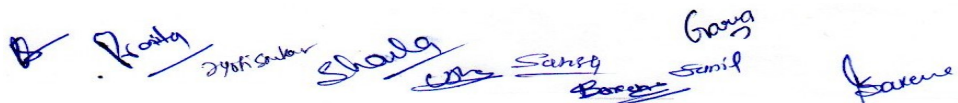Interface Development for Mobile Apps, Intents and Services, Storing and Retrieving Data.

UNIT IV
Mobility and Location Based Services, Communications, Web Telephony, Notifications and Alarms.

UNIT V
Graphics, Multimedia, Packaging and Deploying, Security and Hacking, Case Study: Android, Symbian /S60, Mac, BREW, JavaME/JavaFX etc.

Books:
1. Mobile Design and Development Brian Fling,
2. Mobile Applications Development Scott B. Guthery, Mary J. Cronin,
3. Professional Android Application Development Reto Meier, Wrox

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assig nments /Seminar		
8	MCA- 304 Elective II(f)	Python Programming	3	1	-	60	20	20	-	-	100	4

Samrat Ashok Technological Institute Vidisha (M.P.)
M.C.A. Two Year Programme

Prerequisite: High School Level Mathematics ,Elementary Knowledge of Computer

UNIT I

ALGORITHMIC PROBLEM SOLVING: Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion), Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II

BASICS OF PYTHONS, CONTROL FLOW AND FUNCTION: Python interpreter and interactive mode; values and types: int, float, Boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Conditionals statements, Iteration: state, while, for, break, continue, pass; Strings: string slices, immutability, string functions and methods, string module

UNIT III

LISTS, TUPLES, DICTIONARIES: Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram

UNIT IV

NumPy & Pandas Package: NumPy Ndarray, data types, array creation, array from existing data, array within numerical range, NumPy array iteration, NumPy mathematical and statistical functions, searchinf and sorting, NumPy linear algebra. Introduction of Pandas, series, DataFrame, Panel. Work with DataFrame, Descriptive statistics, iteration, sorting, indexing and selecting data, statistical function, missing values

UNIT V

Sklearn: Implementation of various machine learning algorithms like linear regression , knn, and other classification and clustering algorithm using sklearn package

Books:

1. An Introduction to Python"byGuidovanRossumandFredL.DrakeJr,RevisedandupdatedforPython 3.2, Network Theory Ltd., 2011
2. "ProgrammingPython"byMarkLutz,O'ReillyMedia,Inc,2010.
3. "Python for Data analysis :Data Wrangling with Pandas ,NumPy, and I Python" byWesMcKinney,2ndEdition,O'Reilly Media, 2017

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assig nments /Seminar		
9	**MCA- 305 Elective IIi(a)**	**Java Technologies**	3	1	-	60	20	20	-	-	100	4

Samrat Ashok Technological Institute Vidisha (M.P.)
M.C.A. Two Year Programme

Unit I: Java Fundamentals: History of java, Features of Java, OOP's concepts, Java virtual machine, Reflection byte codes, Byte code interpretation, How to get Java, A First java program, Compiling and interpreting Applications, The JDK Directory Structure., Identifiers, Variables, Constants, Primitive Data Types, arrays, expressions, operators., Conditional & looping constructs, Numeric literals, Character literals String, String literals

Unit II: Object-oriented programming with Java Classes and Objects Fields and Methods: Constructors, Overloading methods, Garbage collection Inheritance: Overriding methods, Polymorphism, Making methods and classes final, abstract classes and methods, Use of SUPER. Using Java objects: Printing to the ,Console, Printf Format Strings, String Builder and String Buffer Classes, Methods and ,Messages, Parameter passing, Comparing and identifying objects, Interfaces and Abstract Classes: Separating interface and implementation, UML interfaces and realization, Defining interfaces and implementing interfaces, Extending interfaces Abstract class
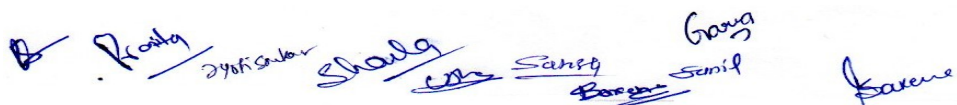
Unit III: Packages, Exception handling and Multithreading The import Statement: Static Imports, Casting, Class path and import, Defining package, Package scopes, Exception Handling: Exceptions overview, Catching exception, Finally block, Exception methods, Declaring exceptions, Defining and throw exceptions, Errors and runtime exceptions, Assertions. Introduction to Threads: Non Threaded Applications Threaded Applications, Creating Applications, Thread States, Runnable threads, Coordinating threads, Interrupting Threads, Runnable interface, Thread Groups, Serialization: Object Serialization, Serializable interface, Serialization API, The Serialization Engine, Transient Fields

Unit IV: Applets, AWT and Java Event handling Model Applets: Applet security restrictions, the class hierarchy for applets, Life cycle of applet HTML Tags for applet, The AWT: The class hierarchy of window fundamentals, The basic user interface components Label, Button ,Check Box, Radio Button, Choice menu Text area, Scroll list, Scroll bar ,Frame, Layout managers-flow layout, Grid layout, Border layout, Card layout. The Java Event Handling Model: Ignoring the event, Self contained events, Delegating events ,The event class hierarchy; The relationship between interface, methods called, parameters and event source Adapter classes, Event classes action Event, Adjustment Event, Container Event, Focus Event, Item Event, key Event, Mouse Event ,Text Event, Window Event

Unit V: Streams, JDBC and Collection Framework Input/output stream classes: Overview of streams, Bytes Vs Characters, Converting Byte, streams to Character Streams, File Object, Binary Input and Output, Print writer Class, Reading and Writing Objects, Basic and Filtered Streams, Collection Framework: The Collection Framework, The Set Interface ,Set Implementation Classes, The List Interface, List Implementation Classes, The Map Interface, Map Implementation Classes JDBC: JDBC-ODBC bridge, The connectivity model, The driver manager, Navigating the resultset object contents, java.sql Package, The JDBC exception classes, Connecting to Remote database, Networking & RMI: Java Networking ,Networking Basics : Socket, Client server, reserved sockets, proxy servers, servers, Inet address, TCP sockets, UDP sockets, RMI for distributed computing: RMI registry services, creating RMI Application

Recommended Books:
1. "The Complete Reference Java 2" by Naughton & Schildt, 7th Edition Tata McGraw, 2011
2. "Beginning Java 2, JDK 5 Ed" by Ivor Horton's, Wiley India, 2004
3. "Effective Java" by Joshua Bloch, 3rd Edition, Addison Wesley, 2018

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assig nments /Seminar		
10	**MCA- 305 Elective IIi(b)**	**Deep Learning**	3	1	-	60	20	20	-	-	100	4

UNIT I
   Introduction to Deep Learning, Bayesian Learning, Decision Surfaces, Linear Classifiers,
      Optimization Techniques, Batch optimization
UNIT II
   Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning,
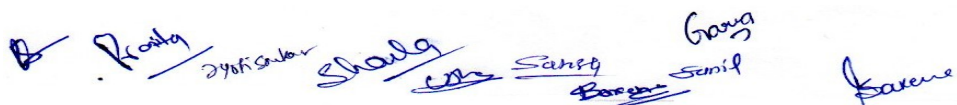   Unsupervised Learning with Deep Network,
UNIT III
   Introduction to Convolutional Neural Network, Building blocks of CNN, RMSProp, Adam
    UNIT IV
    Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection

UNIT V
   Classical Supervised Tasks with Deep Learning, Image Denoising, Generative Modeling with
      Adversarial Network, Recurrent Neural Networks (RNN) for Video Classification

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assig nments /Seminar		

Samrat Ashok Technological Institute Vidisha (M.P.)
M.C.A. Two Year Programme

S. No	Subject Code	Subject Name	L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assig nments /Seminar	Total Marks	Credits
11	MCA- 305 Elective IIi(c)	Big Data Analytics	3	1	-	60	20	20	-	-	100	4

Unit I: Introduction to Big Data: Analytics – Nuances of big data – Value – Issues – Case for Big data – Big data options Team challenge – Big data sources – Acquisition – Nuts and Bolts of Big data. Features of Big Data - Security, Compliance, auditing and protection - Evolution of Big data – Best Practices for Big data Analytics - Big data characteristics - Volume, Veracity, Velocity, Variety – Data Appliance and Integration tools – Greenplum – Informatica

Unit II :Data Analysis: Evolution of analytic scalability – Convergence – parallel processing systems – Cloud computing – grid computing – map reduce – enterprise analytic sand box – analytic data sets – Analytic methods – analytic tools – Cognos – Microstrategy - Pentaho. Analysis approaches – Statistical significance – business approaches – Analytic innovation – Traditional approaches – Iterative
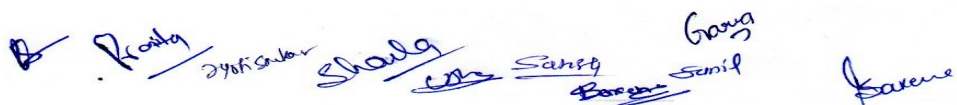
Unit III: Stream Computing: Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window - Realtime Analytics Platform(RTAP) applications IBM Infosphere – Big data at rest – Infosphere streams – Data stage – Statistical analysis – Intelligent scheduler – Infosphere Streams

Unit IV: Predictive Analytics and Visualization: Predictive Analytics – Supervised – Unsupervised learning – Neural networks – Kohonen models – Normal – Deviations from normal patterns – Normal behaviours – Expert options – Variable entry - Mining Frequent itemsets - Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications

Unit V: Frameworks and Applications: IBM for Big Data – Map Reduce Framework - Hadoop – Hive - – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Hbase – Impala – Analyzing big data with twitter – Big data for ECommerce – Big data for blogs

Recommended Books:

1. "Big Data Analytics: Turning Big Data into Big Money" by Frank J Ohlhorst, Wiley and SAS Business
Series, 2012
2. "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with
Advanced Analytics" by Bill Franks, Wiley and SAS Business Series, 2012
3. "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data" by Paul
Zikopoulos, Chris Eaton, Paul Zikopoulos, McGraw Hill, 2011
4. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", 2011

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mid Sem.	Assignments/ Quiz	End Sem. Practical Viva	Practical records/Assignments/Seminar		
12	**MCA- 305 Elective IIi(d)**	**Advance DBMS**	3	1	-	60	20	20	-	-	100	4

Unit I

Extended ER model: Class/Subclass relationship, Specialization, Generalization, constraint and
characteristic of specialization and generalization, Aggregation.

Query Processing & optimization: Overview, Measures of cost, Selection operation, Sorting, Join operations, Evaluation of expressions, Estimating statistics of expression results, Transformation of relational expression, Choice of evaluation plan, Materialized view.

Unit II

Backup, Recovery, Indexing and Security in Data base: Recovery concepts, Recovery

techniques based on deferred updates and immediate updates, shadow recovery, Database backup and recovery from catastrophic failures. Recovery in distributed database, Index structures for single dimension searches: Primary indexing, secondary indexing, cluster indexing, and multi level indexing, Index structure for multi dimension searches: Grid files, KD-tree, Quad tree & R-tree. Database security and its issues, granting and revoking privileges, Role based access control for multilevel security.

Unit III

Parallel & distributed data base: Centralized and client server architecture, Server system architecture, parallel systems, Distributed systems, Parallel database: I/O parallelism, Inter and intra query parallelism, Inter and intra operation Parallelism, Design of parallel system.

Distributed database concept, Distributed database storage, Distributed transaction, Commit Protocol, Concurrency control, Distributed query processing.

UNIT-IV

Object based database:

Object oriented data model, Object oriented language, Persistent programming language, Object relational database: Nested relation, Complex type, Inheritance, reference type, Query with complex type, function and procedure storage for object database, Examples of OODBMS. UNIT-V
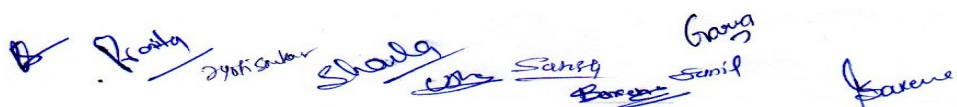
Mobile, Multimedia and Web Database:

Location and handoff management, Effect of mobility on data management, Location dependent data distribution, Mobile transaction models, Concurrency control, Commit protocol, Mobile database recovery schemes. Multimedia data structure, Image database, Text/Documents database, Video and Audio database. Accessing data through web, Web servers, XML database, XML data model, Xml schema, Xquery, Efficient evaluation of XML queries.

Books: 1. Elmasri and Navathe, Fundamentals of Database Systems, Pearson Education.
2. Korth, Silberchatz, Sudarshan, Database System Concepts, McGraw-Hill.
3. C.J.Date & Longman, Introduction to Database Systems, Pearson Education.
4. V.S.Subramanian, Principles of Multimedia Database Systems, Harcourt India Pvt. Ltd.,
5. Vijay Kumar, Mobile Database Systems, John Wiley & Sons

Note: Paper is to be set unit wise with internal choice.

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mid Sem.	Assignments/ Quiz	End Sem. Practical Viva	Practical records/Assignments /Seminar		
13	MCA- 305 Elective IIi(e)	E-Commerce & Information Security	3	1	-	60	20	20	-	-	100	4

Unit-I: E-commerce and its Technological Aspects Overview of developments in Information Technology and Defining E- Commerce: The scope of E commerce, Electronic Market, Electronic Data Interchange, Internet Commerce, Benefits and limitations of E-Commerce, Produce a generic framework for E-Commerce, Architectural framework of Electronic Commerce, Web based E Commerce Architecture

Unit-II: Consumer Oriented E Commerce E-Retailing: Traditional retailing and e retailing, Benefits of e retailing, Key success factors, Models of e retailing, Features of e retailing. E services: Categories of e-services, Web- enabled services, matchmaking services, Information-selling on the web, e entertainment, Auctions and other specialized services. Business to Business Electronic Commerce
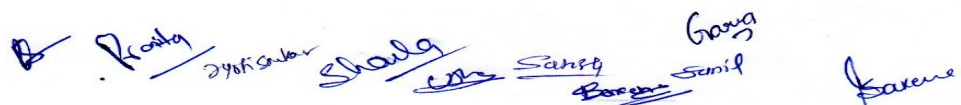
Unit-III: Electronic Data Interchange: Benefits of EDI, EDI technology, EDI standards, EDI communications, EDI Implementation, EDI Agreements, EDI Security. Electronic Payment Systems, Need of Electronic Payment System: Study and examine the use of Electronic Payment system and the protocols used, Study Electronic Fund Transfer and secure electronic transaction protocol for credit card payment. Digital economy: Identify the methods of payments on the net – Electronic Cash, cheques and credit cards on the Internet

Unit-IV: Security in E Commerce Threats in Computer Systems: Virus, Cyber Crime Network Security: Encryption, Protecting Web server with a Firewall, Firewall and the Security Policy, Network Firewalls and Application Firewalls, Proxy Server. Issues in E Commerce Understanding Ethical, Social and Political issues in E- Commerce: A model for Organizing the issues, Basic Ethical Concepts, Analyzing Ethical Dilemmas, Candidate Ethical principles Privacy and Information Rights: Information collected at E-Commerce Websites, The Concept of Privacy, Legal protections Intellectual Property Rights: Types of Intellectual Property protection, Governance

Unit-V: Information Security-Orientation (learning objectives, performance evaluation, etc.), What is Information Security? Examples of Information Security Incidents, what is Information Security Management the three concepts of Information Security (Confidentiality, Integrity, Availability), Basic terminologies in Information Security, Human Aspect of Information Security, social Engineering

Recommended Books:

1. " Electronic Commerce: From Vision to Fulfillment" by Elias. M. Awad, Prentice-Hall of

India Pvt Ltd, 2002 2. "Electronic Commerce-A Manager's guide" by RaviKalakota, Andrew B.

Whinston, Addison- Wesley, 1997 3. "Principles of Information Security" by Michael E.

Whitman and Herbert J. Mattord, 2009

S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			Samrat Ashok Technological Institute Vidisha (M.P.) **M.C.A. Two Year Programme**									
			L	T	P	End sem. Exam.	Mid Sem.	Assignments/ Quiz	End Sem. Practical Viva	Practical records/Assignments /Seminar		
13	MCA- 305 Elective IIi(f)	**Digital Image Processing**	3	1	-	60	20	20	-	-	100	4

Prerequisite: To study the image fundamentals and mathematical transforms necessary for image processing.

Unit - I

Digital Image Fundamentals:Introduction and signal digitization, A simple image model, Sampling and Quantization, Pixel relationship, Camera models & imaging geometry, Image interpolation, Image acquisition systems, Different types of digital images.

Unit - II

Image Transformations:Introduction to Fourier transforms, Discrete Fourier transforms, Fast Fourier transform, Walsh transformation, Hadmordtransformation, Discrete Cosine Transformation.

Unit - III

Image Enhancement:Filters in spatial and frequency domains, Histogram based processing. Image subtraction, Averaging, Image smoothing, Nedion filtering, Low pass filtering, Image sharpening by High pass filtering, Image restoration & Image registration, Colour image processing.

Unit - IV

Image Encoding and Segmentation Encoding:Mapping, Quantizer, Coder. Error free compression, Lossy Compression schemes. JPEG Compression standard. Detection of discontinuation by point detection, Line detection, edge detection, Edge linking and boundary detection, Local analysis, Global processing via Hough transforms and graph theoretic techniques.

Unit - V

Morphological image processing:Mathematical Morphology, Binary, Dilation, crosses, Opening and closing, Simple methods of representation, Signatures, Boundary segments, Skeleton of a region, Polynomial approximation, Object representation, description and recognition.

Text Books

1. Digital Image Processing, Second Edition by Rafel C. Gonzalez and Richard E. Woods, Pearson Education
2. Rafael C Gonzalez, Richard E Woods 3rd Edition, Digital Image Processing Pearson.
3. Sonka, Digital Image Processing & Computer Vision, Cengage Learning.
4. Jayaraman, Digital Image Processing, TMH.
5. Pratt, Digital Image Processing, Wiley India.
6. Annadurai, Fundamentals of Digital Image Processing,Pearson Education.

Samrat Ashok Technological Institute Vidisha (M.P.) M.C.A. Two Year Programme											
S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assig nments /Seminar		
14	MCA-306	Minor Project	-	-	6	-	-	-	100	50	150	6

*A web based application of any real world problem needs to implement using any technology for front end and back end.

Samrat Ashok Technological Institute Vidisha (M.P.) M.C.A. Two Year Programme											
S. No	Subject Code	Subject Name	Periods Per Week			Maximum Marks (Theory)			Maximum Marks (Practical)		Total Marks	Credits
			L	T	P	End sem. Exam.	Mi d Sem.	Assignments/ Quiz	End Sem. Practic al Viva	Practical records/Assig nments /Seminar		
15	MCA-306	Programming Lab -IV (Python)	-	-	4	-	-	-	60	40	100	4

*Students have to perform experiments for data analytics and machine learning using python programming and its different packages.