

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Computer Applications
Name of Program: MCA (AI&ML) III Semester

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY			PRACTICAL	
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
MCA301	DCC	Design Methods and Analysis of Algorithms	3	1	0	4	60	20	20	0	0

LEGENDS: L -Lecture; T -Tutorial/Teacher Guided Student Activity; P -Practical; C -Credit; Q/A - Quiz/Assignment/Attendance, MST -Mid Sem Test.

*Teacher Assessment shall be based on following components: Quiz/Assignment/Project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Educational Objectives (CEOs):

- To familiarize the students with the need and scope of the subject.
- To develop the analytical skills of students so that they can better understand the problem and devise algorithms efficiently.
- Using simple and well drawn illustrations develop their analytical and programming skills.
- To cover the various data structures and their applications so that aspirants can explore this territory
- To take on the more challenging concepts.

Course Outcomes (Cos): After the completion of the course the student will be able to

- Understand the real world problems and model them
- Understand the algorithms and the algorithm design process
- Choose a suitable strategy to devise solution of a given problem
- identify, formulate and solve programming problems
- select appropriate data structures for the solution of a given problem
- analyze the algorithms for correctness and in terms of complexity for best, worst and average cases
- function on multi-disciplinary teams
- understand the professional and ethical responsibility

Pre-requisites: Data structure and discrete structures, models of computation.

Unit-I

Introduction to Algorithm: Definition, Criteria of Algorithm, Algorithm Analysis, Time and Space complexity, Asymptotic notation: Big Oh, Omega and Theta, Best, Average and Worst case analysis.

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Unit-II

Design of Algorithm, Types of algorithm strategies, Recurrence relation: Master method, Substitution method, Analysis of algorithm, Brute-force approach: Sequential Search, Selection Sort.

Divide and Conquer: Structure of divide-and-conquer algorithms: Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication, Analysis of Divide and Conquer methods, Comparison of Searching and Sorting Algorithms.

Unit-III

Graph searching and Traversal: Overview, Traversal methods (Depth First and Breadth First search), Greedy Method: Overview of the greedy paradigms, examples of exact optimization solution (minimum cost spanning tree), Approximate solution (Knapsack problem), Single Source Shortest Paths.

Branch and Bound: LC searching Bounding, FIFO and LIFO Branch and Bound, LC Branch and Bound application: 0/1 Knapsack Problem, Traveling Salesman Problem.

Unit-IV

Dynamic programming: An Overview, Difference between Dynamic Programming and Divide and Conquer, Applications: Shortest Path in Graph, Matrix Chain Multiplication, Traveling Salesman Problem, Longest Common Sequence. Back tracking: Overview, 8-Queensproblem, and Knapsack problem

Unit-V

Computational Complexity: Complexity measures, Polynomial Vs non-polynomial time complexity; NP-hard and NP-complete classes, Relation among P, NP, NPC and NPH, Examples. Combinational Algorithms, String Processing Algorithm, Algebraic Algorithms, Set Algorithms.

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Text Books:

1. Ullman, "Analysis and Design of Algorithm", TMH.
2. Goodman, "Introduction to the Design & Analysis of Algorithms, TMH-2002.
3. Sara Basse, A. V. Gelder, "Computer Algorithms," Addison Wesley.
4. T. H. Cormen, Leiserson, Rivest and Stein, "Introduction of Computer algorithm," PHI.
5. E. Horowitz, S. Sahni, and S. Rajsekaran, "Fundamentals of Computer Algorithms," Galgotia Publication.

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MCA302N	DCC	Software Engineering	3	0	0	3	60	20	20	0	0

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

Q/A – Quiz/Assignment/Attendance, MST - Mid Sem Test.

***Teacher Assessment** shall be based on following components: Quiz / Assignment / Project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Education Objectives (CEOs):

- To provide knowledge about system development.
- To impart knowledge about software process models.
- To provide detailed knowledge about software design.
- To acquaint students with software quality and testing.
- To provide study of MIS.

Course Outcomes (COs): Students will be having:

- An ability to understand system design and its constraints.
- An ability to apply knowledge of software engineering.
- An ability to design a system, a component or process to meet desired needs.
- An ability to identify, formulate and solve engineering Problems
- An ability to measure and to understand quality issues.
- An ability to understand MIS and DSS.

UNIT -I

Introduction to Software Engineering: Software problem, Software engineering problem, Software engineering approach, Software characteristics and Applications. System's concept, characteristics of system, elements of system, The System Development Life Cycle, The Role of System Analyst.

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UNIT -II

Software Processes: Software processes and its components, characteristics of software processes, Software development processes: Linear Sequential model, Prototyping model, RAD model, Iterative Enhancement model, Spiral model, Component based development, Comparative study of various development models.

UNIT-III

Software Project Planning: Project planning objectives, Decomposition Techniques, Empirical estimation models, The Make/Buy Decision., Risk analysis. Software Design: Design Principles, Cohesion & Coupling.

UNIT-IV

Software Quality Assurance: Quality Concepts, The Quality Movement. Software Reviews: Formal Technical Reviews. Statistical Software Quality Assurance, Software Reliability. **Software Testing Techniques:** Testing fundamentals, White box testing, Black box testing. Testing Strategies: A strategic approach of software testing strategic issues, unit testing, integration testing, validation testing, system testing.

UNIT-V

MIS & DSS: Introduction to MIS, long range planning, development and implementation of an MIS, Applications of MIS in manufacturing sector and service sector. Decision Support System concepts, types of DSS.

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MCA302N	DCC	Software Engineering	3	0	0	3	60	20	20	0	0

Text Books:

1. R. S. Pressman, “Software Engineering – A practitioner’s approach”, 6th ed., McGraw Hill Int.
2. PankajJalote “Software Engineering”, Kindle Edition, Wiley Publications.
3. Ian Sommerville : Software Engineering 6thedition (Addison-Wesley).
4. Richard Fairley : Software Engineering Concepts (TMH).
5. Elis Awad, "System Analysis & Design", Galgotia publications.
6. W.S. Jawadekar: Management Information Systems, TMH Publication, India.

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MCA311	DEC	Cloud Computing	3	0	0	3	60	20	20	0	0

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Course Education Objectives (CEOs):

The goal of this course is to provide students with an understanding of basic concepts of cloud computing along with cloud computing architecture, cloud management and cloud security.

Course Outcomes (COs): After course completion Students will be able to understand:

- Concept of cloud computing with broader perspective of cloud architecture and reference models.
- Theory of cloud Management and its security.
- Virtualization Technology Management.
- Applications of cloud computing with the help of some important commercial systems like Google App Engine, Microsoft Azure and Amazon.

Unit-I

Cloud Computing: Introduction, Historical development, principles and vision, Cloud services requirements, Types of Clouds, Advantages and disadvantages of cloud computing, effect of cloud computing on human lives, Characteristics of Cloud Computing, Cloud and dynamic infrastructure, key elements in adopting cloud, Cloud adoption rudiments.

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MCA311	DEC	Cloud Computing	3	0	0	3	60	20	20	0	0

Unit-II

Architecture for Cloud Computing: Cloud Computing Environments, Characteristics of cloud computing as per NIST, Concepts of Deployment Models and Service Models, Cloud Interoperability & Standards, Scalability and Fault Tolerance.

Cloud Solutions: Cloud Ecosystem and its benefits, Cloud Business Process Management, Cloud Service Management.

Cloud Offerings: Cloud Analytics, Testing Under Control.

Unit-III

Cloud Management: Resiliency, Provisioning, Asset management, Concepts of Map reduce, Cloud Governance, High Availability and Disaster Recovery. Market Based Management of Clouds, Federated Clouds/Inter Cloud: Characterization & Definition.

Unit-IV

Virtualization Technology: Introduction, working process of virtualization and benefits of virtualization. **Type of virtualization:** Hardware Virtualization, Software Virtualization, Memory Virtualization, Storage Virtualization, Data and Network Virtualization, Desktop and Application virtualization. Technology used for virtualization, Hypervisor Virtualization Software, Virtual LAN (VLAN) and Virtual SAN (VSAN) with their benefits.

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MCA311	DEC	Cloud Computing	3	0	0	3	60	20	20	0	0

Unit-V

Cloud Security: Introduction of cloud Information security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, and Security Challenges. Introduction of cloud applications: ECG Analysis in the cloud. CRM and ERP, Social networking.

Case study of cloud computing platforms: Google App Engine, Microsoft Azure, Hadoop. Amazon.

Textbooks:

1. Judith S. Hurwitz, Daniel Kirsch” Cloud Computing For Dummies, 2nd Edition, John Wiley and Sons inc., New Jersey, 2000.
2. Hashmi, Tahir, Landreau, Jean-Francois” Cloud Strategy: A Decision-based Approach to cloud migration” Gregor Hohpe: An architect Elevator Guide, 2019-2020.
3. Kavis, Michael J. “Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS) John Wiley and Sons inc., Hoboken, New Jersey, 2000.
4. Mr. Ray J Rafels “Cloud Computing: From Beginning to End” Second edition, paperback, 2018.

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MCA321	DEC	Internet of Things	3	0	0	3	60	20	20	0	0

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Course Education Objectives (CEOs):

- Vision and Introduction to IoT.
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Outcomes (COs):

At the end of the course the student will be able to:

- Understand the vision of IoT from a global context.
- Determine the Market perspective of IoT.
- Use of Devices, Gateways and Data Management in IoT.
- Building state of the art architecture in IoT.
- Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints

Unit-I

Introduction to the internet of things – origins, early concepts and products, Examples of current products and value propositions, Architectures and design patterns, Analysis of a full connected- object experience. State of the Art, challenges and future directions. Role of Cloud in IoT, Security aspects in IoT.

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Unit-II

Elements of IoT: Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

Unit-III

IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration.

Unit-IV

Device data storage: Unstructured data storage on cloud/local server, Authentication, authorization of devices.

Unit-V

IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Home Automation.

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MCA321	DEC	Internet of Things	3	0	0	3	60	20	20	0	0

Text Books:

1. Vijay Madiseti, Arshdeep Bahga, Internet of Things, “A Hands on Approach”, University Press.
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, “Introduction to Internet of Things: A practical Approach”, ETI Labs.
3. Jeeva Jose, “Internet of Things”, Edition 2018, Khanna Publishing House, Delhi.
4. Adrian McEwen, “Designing the Internet of Things”, Edition 2013, Wiley.
5. Raj Kamal, “Internet of Things: Architecture and Design”, Edition 2017, McGraw Hill.

Reference Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
2. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013

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MCA331	DEC	Distributed Systems	3	0	0	3	60	20	20	0	0

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Course Education Objectives (CEOs):

- Understand foundations of Distributed Systems
- Understand the network virtualization, remote method invocation and objects and RPC.
- Introduce the idea of peer to peer services and file system
- Methods of understanding clock synchronization protocols & replication
- Understand the issues involved in studying process and resource management

Course Outcomes (COs):

- Discuss trends in Distributed Systems
- Demonstrate an understanding of the challenges faced by future distributed systems
- Learn and apply the concept of network virtualization and remote method invocation
- Apply network virtualization in Real time systems like
- Analyze the mechanism of peer to peer systems, DFS and DNS.
- Understand key mechanisms and models for distributed systems including logical clocks,
- Causality, distributed mutual exclusion, distributed deadlocks.
- Design process and resource management systems.

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MCA331	DEC	Distributed Systems	3	0	0	3	60	20	20	0	0

UNIT-I

Concepts of Distributed Systems: Introduction, Goals of Distributed Systems, Examples of distributed Systems Distributed

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks.

UNIT-II

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and Non Token based algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

UNIT-III

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem.

Distributed Objects and Remote Invocation: Communication between distributed objects, Remote procedure call, Events and notifications.

UNIT-IV

Distributed File Systems: File service architecture, Sun Network File System, The Andrew File System. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery

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MCA331	DEC	Distributed Systems	3	0	0	3	60	20	20	0	0

UNIT-V

Replication: System model and group communication, Fault-tolerant services, Transactions with replicated data. Distributed Algorithms: Destination based routing, APP (assignment problem in parallel), Deadlock free Packet switching, Introduction to Wave & traversal algorithms, Election algorithm.

Text Books:

1. Sinha P. K., “Distributed operating systems; Concepts and design”, PHI Learning.
2. Mahajan S. & Shah, Distributed Computing, Oxford Press
3. Singhal&Shivaratri, “Advanced Concept in Operating Systems”, McGraw Hill.
4. Tanenbaum and Steen, “Distributed systems: Principles and paradigms”, 2nd edition, PHI Learning.
5. Coulouris, Dollimore, Kindberg, “Distributed System: Concepts and Design”, Pearson Ed.
6. Gerald Tel, “Distributed Algorithms”, Cambridge University Press.

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MCA312	DEC	Data Mining and Warehousing	3	0	0	3	60	20	20	0	0

Legends: L -Lecture; T -Tutorial/Teacher Guided Student Activity; P -Practical; C -Credit; Q/A - Quiz/Assignment/Attendance, MST -Mid Sem Test.

*Teacher Assessment shall be based on following components: Quiz/Assignment/Project/Participation in class (Given that no component shall be exceed 10 Marks)

Course Educational Objectives (CEOs):

- To familiarize the students with the need and scope of the subject.
- To build the mental makeup of the students for the field of data mining
- To develop a better understanding of the recent techniques like Support Vector Machine, Rough Set Theory etc as the tools of data mining.
- Using simple and well drawn illustrations develop students skills to discover knowledge to support the decision making process.
- To make the students well versed with the latest trends in data warehousing and data mining.

Course Outcomes (Cos): The student will be able to

- Understand the basic principles, concepts and applications of data warehousing and data mining
- introduce the task of data mining as an important phase of knowledge recovery process
- Ability to do Conceptual, Logical and Physical design of Data Warehouses, OLAP applications and OLAP deployment
- Have a good knowledge of the fundamental concepts that provide the foundation of data mining
- Design and implement a data warehouse or data mart to present information needed by management in a form that is usable for management client
- Design and implement the data pre-processing solutions for different applications
- Identify and use suitable data mining techniques for Knowledge Discovery
- Develop dashboard solutions for presentation of knowledge
- Explore the subject to start as a researcher

UNIT –I

Motivation, importance, Data types for Data Mining: Relation Databases, Data Warehouses, Transactional databases, Advanced Database System and its applications, Data mining functionalities: Concept/Class description, Association Analysis, Classification & Prediction, Cluster Analysis, Outlier Analysis, Evolution Analysis, Classification of Data Mining Systems, Major Issues in Data Mining.

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MCA312	DEC	Data Mining and Warehousing	3	0	0	3	60	20	20	0	0

UNIT –II

Data Warehouse and OLAP Technology for Data Mining: Differences between Operational Database Systems and Data Warehouse, a multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Servers, Implementation of Data Warehouse, Data Cube Technology.

UNIT-III

Data Pre-processing: Problems with real world data, data pre-processing as a process, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation. Data Mining Primitives, Languages and System Architectures, Concept Description: Characterization and Comparison, Analytical Characterization.

UNIT –IV

Mining Association Rules in Large Databases: Association Rule Mining: Market Basket Analysis, Basic Concepts, Mining Single-Dimensional Boolean Association Rules from Transactional Databases: different algorithms, the Apriori, Partition, Dynamic Itemset Counting, pincer search, FP tree Growth, Generating Association rules from Frequent items, Improving the efficiency of Apriori, Mining Multilevel Association Rules, Multidimensional Association Rules, Constraint-Based Association Mining.

UNIT –V

Classification, Prediction and Cluster Analysis: Issues regarding classification and prediction, Different Classification and Clustering Methods, Cluster Analysis, Applications and Trends in Data Mining: Data Mining Applications, currently available tools.

Text Books:

1. J. Han and M. Kamber, 'Data Mining: Concepts and Techniques', Morgan Kaufmann Pub.
2. Berson, 'Data Warehousing, Data Mining and OLAP', TMH.
3. W.H. Inmon, 'Building the Data Warehouse', Wiley India.
4. Anahory, 'Data Warehousing in Real World', Pearson Education.
5. Adriaans, 'Data Mining', Pearson Education.
6. A.K. Pujari, 'Data Mining Techniques', University Press, Hyderabad.

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MCA322	DEC	Cryptography and Information Security	3	0	0	3	60	20	20	0	0

Legends: L – Lecture; T – Tutorial/Teacher Guided Student Activity; P – Practical; Q/A – Quiz/Assignment/Attendance; MST – Mid Semester Test.

***Teacher Assessment** shall be based on following components: Quiz/Assignment/Project/Participation in class activities, given that no component shall exceed more than 10 marks

Course Education Objectives (CEOs):

- To learn about different Cryptography Encryption and Decryption Technique.
- To understand the concepts of various asymmetric and symmetric algorithms.
- To understand the different aspects of Information Security and other security areas.

Course Outcomes (COs): Upon completion of the subject, students will be able to:

- Explain concepts of cryptography and ciphers.
- Describe advance encryption techniques and algorithms.
- Understand the key exchange protocols.
- Define information systems and its related security aspects.
- Explore different types of security including network, computer, internet security.

Unit-I

Cryptography: Concepts & Techniques: Introduction, Plaintext & Cipher text, Caesar Cipher, Substitution Techniques, Substitution Boxes (SBoxes), Permutation Cipher, Transposition Techniques, Encryption & Decryption, Symmetric and Asymmetric key Cryptography, Key Range & Key Size.

Unit-II

Symmetric Key Algorithm: Introduction of Block Ciphers, Overview of Symmetric Key Cryptography, DES (Data Encryption Standard) algorithm, Double DES Triple DES, AES, IDEA (International Data Encryption Algorithm) algorithm.

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Unit-III

Asymmetric Key Algorithm: Overview of Asymmetric key Cryptography, RSA algorithm, Symmetric & Asymmetric key Cryptography together, Diffie-Hellman Key Exchange, Digital Signature, Basic concepts of Message Digest and Hash Function. Man in Middle Attack, DoS and DDoS Attacks.

Unit-IV

Information Security: Introduction of Information System, Functions and Types of Information System, Information System Threats and Attacks Defined, Security Services, Information System Security and control, Cyber Crime and Information Security

Unit-V

Other Security: Threats in Network, Network Security, Attacks on Computer, Computer Security, Network Access Control and Cloud Security, Transport- Level Security, Wireless Network Security, Electronic Mail Security, IP Security.

Text Books:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Sixth Edition, Pearson Education, 2013.
2. C. Kaufman, R. Perlman and M. Speciner, "Network Security: Private Communication in a Public World", Second Edition, Pearson, 2016.
3. AtulKahate, "Cryptography & Network Security", Third Edition, McGraw Hill Education, 2017.
4. Gaurav Gupta, Sarika Gupta "Information Security and Cyber Laws", First Edition, Khanna Publishing, 2019

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MCA322	DEC	Cryptography and Information Security	3	0	0	3	60	20	20	0	0

References:

1. Wenbo Mao, "Modern Cryptography: Theory and Practice", First Edition, Prentice Hall, 2003.
2. William Stallings, "Network Security Essentials: Applications and Standards", Sixth Edition, Pearson Education, 2018.
3. Douglas R. Stinson, M. Paterson, "Cryptography: Theory and Practice", Fourth Edition, CRC Press, 2018.
4. Elizabeth D. Zwicky, Simon Cooper, D. Brent Chapman, "Building Internet Firewalls", Second Edition, O'Reilly, 2000.
5. <http://nptel.ac.in/>

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MCA332	DEC	Big Data Analytics	3	0	0	3	60	20	20	0	0

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***Teacher Assessment** shall be based on following components: Quiz/Assignment/Project/Participation in class activities, given that no component shall exceed more than 10 marks

Course Education Objectives (CEOs):The objective of this course is to teach students about:

1. To familiarize the students with the need and scope of the subject.
2. Provide an exposure giving a strong foundation to the data analytics practices.
3. Big data computing technologies, Watson studio
4. Understand the challenges posed by distributed applications and how ZooKeeper is designed to Handle.
5. create a basis for the use of advanced investigative and computational methods to convert information to useful knowledge.
6. Develop an understanding of how business analytics is actually performed
7. Develop an understanding of the complete open-source Hadoop ecosystem and its near term future direction
8. Covers foundational techniques and tools required for data science and big data analytics like Hadoop, NoSQLMapReduce, BIGSQL, Watson studio.

Course Outcomes (COs):After the completion of the course the student will be able to:

1. understanding importance and scope of the subject
2. understand the technological foundations of the Big Data
3. differentiate the structured and unstructured data and different databases to store structured and unstructured data like Mongo DB, HBase etc.
4. store and manipulate the different types of data
5. have a knowledge of HADOOP and Hadoop ecosystem and its uses in Big Data
6. understand and apply the Big Data Analytics.
7. Understand the functions and features of HDP.

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MCA332	DEC	Big Data Analytics	3	0	0	3	60	20	20	0	0

Syllabus

Unit I

Big Data: Introduction and basics, Evolution of Data Management, Definition, Importance, Big Data Types, Structured and unstructured Data, Sources of big structured data and unstructured data, Architecture of Big Data Management System, Stages of Big Data Management,

Big Data Technology Foundations: Technology Components, virtualization, distributed computing, Cloud and Big Data, Integration of data types into a big data environment.

Unit II

Big Data and operational Databases: relational, non relational, key-value pair, document, column oriented, graph, spatial databases, MapReduce, Hadoop, Hadoop Foundation and Ecosystem, Appliances and Big Data Warehouse, Big data Implementation, Big Data Applications. roles in building a complete big data, solution to common business problems.

Hadoop and HDFS: need for a big data strategy in terms of parallel reading of large data files and internode network speed in a cluster, Hadoop Distributed File System (HDFS), function of the NameNode and DataNodes in a Hadoop cluster, files are stored and blocks ("splits") are replicated. Hive, Sqoop.

Unit III

Big Data Analytics: Introduction, Basic and Advanced Analytics, Drivers, Pillars of Analytics: descriptive, predictive and prescriptive. Core Components of analytical data architecture, Performance issues, Parallel vs. distributed processing, Shared nothing data architecture and Massive parallel processing, Elastic scalability, Data loading patterns.

Data Analytics lifecycle: Discovery, Data Preparation, Model Planning, Model Building, Communicating results and findings.

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Unit IV

Apache Ambari: The purpose of Apache Ambari in the HDP stack, architecture of Ambari and Ambari' relation to other services and components of a Hadoop cluster, components of Ambari and their functions, initiating start and stop services from Ambari Web Console.

Introduction of Hortonworks Data Platform – HDP: functions and features of HDP, the IBM value-add components, basics of IBM Watson Studio, description of the purpose of the value-add components

Unit V

MapReduce and YARN: MapReduce model v1, the limitations of Hadoop 1 and MapReduce, handling the Mapper class with Java, Reducer class and the program driver needed to access MapReduce, the YARN model, Hadoop 2/YARN versus Hadoop 1

ZooKeeper, Slider, and Knox: The challenges with distributed applications and how ZooKeeper is designed to handle them, ZooKeeper: role within the Apache Hadoop infrastructure, the realm of Big Data management, real-world applications, services to manage distributed systems, ZooKeeper CLI and ZooKeeper services.

TEXT BOOKS:

1. "Introduction to Infosphere Big Insights", IBM Career Education
2. "Changing Business with Data Insight", IBM Career Education
3. "Big Insights Analytics for Business Analysts", IBM Career Education
4. "Hadoop: The Definitive Guide Paperback – 2015" by Tom White, Shroff Publishers & Distributors Private Limited - Mumbai; Fourth edition (2015).
5. "Big Data and Hadoop" by V. K. Jain, Khanna Publishers; 1 edition (1 June 2015)
6. "Big Data for Dummies" by Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman Wiley, ISBN: 978-1- 118-50422-2, 2013
7. "Data Analytics, Models, Algorithms for Intelligent Data Analysis by Thomas A., Springer Vieweg , ISBN 978-3-8348-2589-6, 2013

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MCA332	DEC	Big Data Analytics	3	0	0	3	60	20	20	0	0

REFERENCE BOOKS:

1. “Big Data: A Revolution That Will Transform How We Live, Work, and Think” by Kenneth Cukier, Viktor Mayer-Schönberger; Mariner Books; Edition (2014)
2. “Big Data: Using Smart Big Data, Analytics and Metrics to Make Better” by Bernard Marr; Wiley; Edition 1st (2015)
3. “Mining of Massive Datasets, Chapter 2”, by Ullman, Rajaraman,
4. “MapReduce and Parallel DBMS” by Stonebraker et al., Friends or Foes?, Communications of the ACM, January 2010.
5. “MapReduce: A Flexible Data Processing Tool” by Dean and Ghemawat, Communications of the ACM, January 2010.

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MCAAIML305	SEC	Machine Learning using Python	3	0	2	4	60	20	20	30	20

Legends: L – Lecture; T – Tutorial/Teacher Guided Student Activity; P – Practical; Q/A – Quiz/Assignment/Attendance; MST – Mid Semester Test.

***Teacher Assessment** shall be based on following components: Quiz/Assignment/Project/Participation in class activities, given that no component shall exceed more than 10 marks.

Course Education Objectives (CEOs): The goal of this course is to provide students

- an understanding of advanced concepts of Machine Learning.
- an understanding of Machine Learning models.
- an understanding of evaluation matrices for ML model.
- An understanding of application areas of different real life problems.

Course Outcomes (COs): After completion of this syllabus students will be able to

- Apply the principles of supervised learning.
- Apply the principles of unsupervised learning.
- Apply the principles of performance matrices to evaluate ML Model.
- Write Python code to solve real-world problems using ML Models.

Unit-I

Introduction to Machine Learning & Python Libraries

An Introduction to AI and its concepts, definition and types of ML: Supervised, Unsupervised, Reinforcement Learning, Traditional Programming vs ML, Real-world applications, ML pipeline overview, Python for ML: NumPy, pandas, matplotlib, seaborn, scikit-learn.

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MCAAIML305	SEC	Machine Learning using Python	3	0	2	4	60	20	20	30	20

Unit-II

Data Preprocessing & Feature Engineering

Handling missing values, Encoding categorical variables (Label Encoding, One-Hot).

Feature scaling: Standardization, Normalization, Feature selection and extraction, Outlier detection and handling, Train-Test Split and Cross-validation.

Unit-III

Supervised Learning – Regression & Classification

Linear Regression (Simple and Multiple), Logistic Regression, k-Nearest Neighbours (k-NN), Decision Trees and Random Forests, Support Vector Machines (SVM), Naive Bayes Classifier, Overfitting and Regularization

Unit-IV

Un-Supervised Learning – Classification

Clustering: K-Means, Hierarchical Clustering, Dimensionality Reduction: PCA, Anomaly Detection, Applications: Customer segmentation, Document clustering, Evaluation metrics: Accuracy, Confusion Matrix, Precision, Recall, F1 Score, ROC-AUC.

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Unit-V

Model Evaluation and Introduction to Neural Network

Cross-validation strategies, Hyperparameter tuning: Grid Search, Random Search Bias-Variance Trade off, Basics of Neural Networks, Perceptron and Multilayer Perceptron (MLP), Activation Functions, Introduction to TensorFlow / Keras.

Text Books:

1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 3rd Edition, O'Reilly Media, 2022
2. Tom M. Mitchell, Machine Learning, McGraw-Hill Education, 1997.
3. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, The Elements of Statistical Learning, 2nd Edition, Springer.
4. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning, MIT Press, 2016.
5. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012..
6. Prateek Joshi, Artificial Intelligence with Python, 2nd Edition, Packt Publishing, 2017.

List of Practical:

1. **Study and Implementation of Python Libraries for Machine Learning**
 - NumPy: Array creation and operations
 - Pandas: DataFrame creation and manipulation
 - Matplotlib & Seaborn: Basic visualizations
2. **Data Preprocessing and Exploratory Data Analysis (EDA)**
 - Handling missing values
 - Data cleaning

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- Statistical summary and visualization

3. Implementation of Machine Learning Pipeline

- Data collection
- Data preprocessing
- Train-test split
- Model training and evaluation

4. Simple Linear Regression

- Predict a continuous variable using a single feature
- Visualize the regression line

5. Multiple Linear Regression

- Predict a continuous variable using multiple features
- Evaluate model performance using MSE and R^2 score

6. Logistic Regression

- Perform binary classification
- Evaluate using accuracy and confusion matrix

7. k-Nearest Neighbour (k-NN) Classification

- Implement k-NN classifier
- Analyze the effect of different values of k

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8. Decision Tree Classification

- Build and visualize a decision tree
- Analyze feature importance

9. Random Forest Classification

- Train a Random Forest model
- Compare results with Decision Tree classifier

10. Support Vector Machine (SVM)

- Implement SVM for classification
- Compare different kernel functions

11. Naive Bayes Classification

- Implement Gaussian Naive Bayes classifier
- Evaluate classification performance

12. K-Means Clustering

- Perform customer segmentation
- Determine optimal number of clusters using Elbow Method

13. Hierarchical Clustering and PCA

- Generate dendrogram

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MCAAIML305	SEC	Machine Learning using Python	3	0	2	4	60	20	20	30	20

- Apply Principal Component Analysis for dimensionality reduction

14. Model Evaluation and Hyperparameter Tuning

- Accuracy, Precision, Recall, F1-Score, ROC-AUC
- K-Fold Cross Validation
- Grid Search / Random Search

15. Neural Network using TensorFlow/Keras

- Implement Perceptron/Multilayer Perceptron (MLP)
- Study activation functions and evaluate model performance

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Shri Vaishnav Institute of Computer Applications
Name of Program: MCA (AI&ML) III Semester

MBAI301C ADVANCED HUMAN VALUES AND PROFESSIONAL ETHICS

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MBAI301C	AECC	Advanced Human Values and Professional Ethics	60	20	20	-	-	3	-	-	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; AECC- Ability Enhancement Compulsory Course

*Teacher Assessment shall be based on following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objective

The objective of the course is to disseminate the theory and practice of moral code of conduct and familiarize the students with the concepts of “right” and “good” in individual, social and professional context

Examination Scheme

The internal assessment of the students’ performance will be done out of 40 Marks. The semester Examination will be worth 60 Marks. The question paper and semester exam will consist of two sections A and B. Section A will carry 36 Marks and consist of five questions, out of which student will be required to attempt any three questions. Section B will comprise of one or more cases / problems worth 24 marks.

Course Outcomes

1. Help the students to understand right conduct in life.
2. To equip students with understanding of the ethical philosophies, principles, models that directly and indirectly affect personal and professional life.

COURSE CONTENT

Unit I: Inculcating Values at Workplace

1. Values: Concept, Sources, Essence
2. Classification of Values.
3. Values in Indian Culture and Management: Four False Views, Value Tree
4. Eastern and Western Values; Values for Global Managers

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MBA-INTERNATIONAL BUSINESS - III SEMESTER (2022-2024)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MBAI301C	AECC	Advanced Human Values and Professional Ethics	60	20	20	-	-	3	-	-	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; AECC- Ability Enhancement Compulsory Course

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Unit II: Professional Ethics

1. Ethics: Concept, Five P's of Ethical Power, Organisational Tools to Cultivate Ethics
2. Theories of Ethics: Teleological and Deontological
3. Benefits of Managing Ethics in an Organisation
4. Ethical Leadership

Unit III: Indian Ethos and Management Style

1. Indian Ethos and Workplace
2. Emerging Managerial Practices
3. Ethical Considerations in Decision Making and Indian Management Model
4. Core Strategies in Indian Wisdom and Ethical Constraints

Unit IV: Human Behavior – Indian Thoughts

1. Guna Theory
2. Sanskara Theory
3. Nishkama Karma
4. Yoga: Types, Gains; Stress and Yoga

Unit V: Spirituality and Corporate World

1. Spirituality: Concept, Paths to Spirituality
2. Instruments to achieve spirituality
3. Vedantic Approach to Spiritual and Ethical Development
4. Indian Spiritual Tradition.

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Suggested Readings

1. Kausahl, Shyam L. (2006). *Business Ethics – Concepts, Crisis and Solutions*. New Delhi: Deep and Deep Publications Pvt. Limited
2. Murthy, C.S.V. (2012). *Business Ethics –Text and Cases*. Himalaya Publishing House: Mumbai
3. Chakraborty, S. K. (1999). *Values and Ethics for Organizations*. Oxford university press
4. D.Senthil Kumar and A. Senthil Rajan (2008). *Business Ethics and Values*. Himalaya Publishing House: Mumbai

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