



श्री **D**avara **U**niversity

Established under Chhattisgarh Private Universities (Establishment and Operation) Act, 2005

# MCA

## SEMESTER-III

### Programme Curriculum



<b>SEMESTER III</b>											
S.No	Course Code	Course Title	Teaching Hours Per Week				Examination Scheme				Total Marks
			L	T	P	C	Theory		Practical		
							EX	IN	EX	IN	
1.	MCA301	Artificial intelligence	3	1	0	4	70	30	-	-	100
2.	MCA302	Research Methodology	3	1	0	4	70	30	-	-	100
3.	MCA303	Cryptography and Network Security	3	1	0	4	70	30	-	-	100
4.	MCA304	Data Science	3	1	0	4	70	30	-	-	100
<b>Elective</b>											
5.	ELE305	Natural Language Processing	3	1	-	4	70	30	-	-	100
<b>Total Contact Hours Per Week:20</b>		<b>Total Credit:</b>				<b>22</b>	<b>Total Mark</b>				<b>500</b>



<b>PART-A: Introduction</b>		
<b>Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)</b>		<b>Semester-II</b>
		<b>Session: 2024-2028</b>
<b>Course Code</b>	<b>MCA302</b>	
<b>Course Title</b>	<b>Research Methodology</b>	
<b>Course Type</b>	<b>DSC (Discipline Specific Course)</b>	
<b>Prerequisite</b>	As per program	
<b>Course Learning Outcomes (CLO)</b>	<p><b>At the end of this course, the students will be able</b></p> <ol style="list-style-type: none"> <li>1) To give an understanding of fundamentals research.</li> <li>2) The course aims to enable the students learn the concepts of Research techniques.</li> <li>3) it's applicability in the various minor and major researches. Fundamentals of research with specific reference to quantitative research methods would facilitate the students towards exploring the area of their interest.</li> </ol>	
<b>Credit Value</b>	<b>4 Credits</b>	<b>Credit-15 Hours - Learning &amp; Observation</b>
<b>Total Marks</b>	<b>Max. Marks:100</b>	<b>Min marks -40</b>
<b>PART -B: Content of the Course</b>		
<b>Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)</b>		
<b>Unit</b>	<b>Topics (Course Content)</b>	<b>No. of Period</b>
<b>I</b>	Research: An Introduction a) Types of Scientific Methods: Hypothetic-Deductive and Inductive Research b) Types of Research: Basic vs. Applied, Quantitative vs. Qualitative Research c) Principles of a Good Research	<b>15</b>
<b>II</b>	the Research Process a) Stages of conducting a Research b) Problem and Hypothesis: Definition, Types c) Variables: Types, Operational definition	<b>15</b>
<b>III</b>	behavioral Research I a) Control of Extraneous Variables b) Laboratory experiments, Field Experiments c) Field study, Survey behavioral Research II a) Research: Causality and It's criteria b) Threats to Internal and External Validity c) Non-Experimental Research: Co-relational Research, Survey Research, Archival Research	<b>15</b>
<b>IV</b>	sampling and Ethical Issues	<b>15</b>



	a) Sampling Issues: Representativeness and Adequacy b) Sampling Strategies: Probability and Non-probability Sampling, Sampling Errors c) Demand Characteristics and Ethical issues in Research	
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### PART-C: Learning Resources

#### Text Books, Reference Books and Others

- 1) Aronson, E. and Ellsworth D.C., Carlsmith, J.M., Gonzales, M.I.
- 2) Breakwell, G.M., Hammond, Sand Schow, C.F. (Edited) (1995). Research Methods in Psychology. Sage Publications
- 3) • Ebnes, D.G, Kantowitz, B.M., Roediger, H.L, (1989). Research Methods in Psychology. West Publishing Company
- 4) • Greenberg, Jand Folger, R (1988). Controversial Issues in Social Research Method. New York. Springer-Verlag
- 5) • Katz, D. and Festinger, L. (1953). Research Methods in Behavioral Sciences. Holt, Rinehart and Winston, Inc
- 6) • Kerlinger, F.N. (1964). Foundations of Behavioral Research. Holt, Rinehart and Winston, Inc
- 7) • Mohsin, S. M. (1984). Research Methods in Behavioral Sciences. Orient Longman Ltd
- 8) • Schaugneasey, J. J., Zechmeister, B (1990). Research Methods in Psychology. Mc Grawhill Publishing Company, New Delhi
- 9) • Sommer and Sommer, R (1997). A Practical Guide to Behavioral Research. Oxford University Press
- 10) • Weiner, B.J., Brown, D.R., Michels, K

### PART -D: Assessment and Evaluation

#### Suggested Continuous Evaluation Methods:

Maximum Marks: 100 marks

Continuous Internal Assessment (CIA): 30 Marks.

End Semester Exam (ESE): 70 marks

<b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>	<b>Internal test/Quiz:-20 &amp; 20 Assignment /seminar-10 Total marks:-30</b>	<b>Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.</b>
<b>End Semester Exam (ESE):</b>	<b>Two section- A&amp;B</b> <b>Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks</b> <b>Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks</b>	



<b>PART-A: Introduction</b>		
<b>Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)</b>		<b>Semester-II</b>
<b>Session: 2024-2028</b>		
<b>Course Code</b>	<b>MCA303</b>	
<b>Course Title</b>	<b>Cryptography and Network Security</b>	
<b>Course Type</b>	<b>DSC(Discipline Specific Course)</b>	
<b>Prerequisite</b>	As per program	
<b>Course Learning Outcomes (CLO)</b>	<p><b>At the end of this course, the students will be able</b></p> <ol style="list-style-type: none"> <li>1) To make student know, the essentials of computer security, also to provide the basic knowledge of security issues.</li> <li>2) To make students know, different cryptography techniques namely public and private key cryptography.</li> <li>3) To make students understand, network security protocol including firewall.</li> <li>4) The students will be able to know advanced attacking techniques.</li> </ol>	
<b>Credit Value</b>	<b>4 Credits</b>	<b>Credit-15 Hours - Learning &amp; Observation</b>
<b>Total Marks</b>	<b>Max. Marks:100</b>	<b>Min marks -40</b>
<b>PART -B: Content of the Course</b>		
<b>Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)</b>		
<b>Unit</b>	<b>Topics(Course Content)</b>	<b>No. of Period</b>
<b>I</b>	FOUNDATION OF CRYPTOGRAPHY AND SECURITY: -The OSI Security Architecture, A model for network Security ,Symmetric cipher model Substitution techniques Mathematical Tools for Cryptography: modular Arithmetic, Euclid’s Algorithm. Design Principle of Block ciphers: Theory of Block Cipher Design, Feistel ciphers, DES and Triple DES, Strength Of DES, Modes of Operation (ECB, CBC, OFB, CFB).	<b>15</b>
<b>II</b>	UNIT- II PUBLIC KEY CRYPTOGRAPHY: - Prime Numbers and Testing for Primality, Principles of publickey Cryptosystems RSA, Key Management Diffie- Hellman, key exchange, Hashes and Message Digests: MessageAuthentication codes, MD5, SHA-1, HMAC.	<b>15</b>
<b>III</b>	UNIT- III DIGITAL SIGNATURES, CERTIFICATES, AND STANDARDS: - Digital Signature Standard (DSS and DSA), Authentication: Kerberos V4, Electronic Mail Security: Pretty Good Privacy (PGP), System Security: Computer Virus, Firewall and Design Principles, Electronic Commerce Security: Secure Electronic Transaction (SET).	<b>15</b>



<b>IV</b>	IVCYBER SECURITY fundamentals& ATTACKING TECHNIQUES: Security Concepts: Cyber Crimes and Criminals: Definition of cyber-crime, types of cyber-crimes and types of cyber-criminals. Anti- forensics: Use of proxies, use of tunneling techniques. Fraud techniques: Phishing and malicious mobile code, Rogue antivirus, Click fraud. Threat Infrastructure: Botnets, Fast Flux and advanced fast flux.	<b>15</b>
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### PART-C: Learning Resources

**Text Books, Reference Books and Others**

- (1) Cryptography and Network Security, William Stalling, PHI.
- (2) Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill, 2003.
- (3) Cyber Security Essentials, James Graham, Richard, Ryan CRC press, 2011.

### PART -D: Assessment and Evaluation

**Suggested Continuous Evaluation Methods:**

Maximum Marks: 100 marks

Continuous Internal Assessment (CIA): 30 Marks.

End Semester Exam (ESE): 70 marks

<b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>	<b>Internal test/Quiz:-20 &amp; 20 Assignment /seminar-10 Total marks:-30</b>	<b>Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.</b>
<b>End Semester Exam (ESE):</b>	<b>Two section- A&amp;B</b> <b>Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks</b> <b>Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks</b>	



<b>PART-A: Introduction</b>		
<b>Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)</b>		<b>Semester-II</b>
		<b>Session: 2024-2028</b>
<b>Course Code</b>	<b>MCA304</b>	
<b>Course Title</b>	<b>Data Science</b>	
<b>Course Type</b>	<b>DSC(Discipline Specific Course)</b>	
<b>Prerequisite</b>	As per program	
<b>Course Learning Outcomes (CLO)</b>	<p><b>At the end of this course, the students will be able</b></p> <ol style="list-style-type: none"> <li>1) To make students understand the fundamentals of data science</li> <li>2) To introduce python-based programming toolkit for developing basic models</li> <li>3) To make student understand mathematics behind data analysis</li> <li>4) To impart fundamentals of machine learning algorithms</li> <li>5) To design and develop DS models for real time applications</li> </ol>	
<b>Credit Value</b>	<b>4 Credits</b>	<b>Credit-15 Hours - Learning &amp; Observation</b>
<b>Total Marks</b>	<b>Max. Marks:100</b>	<b>Min marks -40</b>
<b>PART -B: Content of the Course</b>		
<b>Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)</b>		
<b>Unit</b>	<b>Topics(Course Content)</b>	<b>No. of Period</b>
<b>I</b>	Data science in a big data world: 1.1 Why Data Science, Benefits and uses of data science; Facets of data. 1.2 The data science process: Setting up goal, retrieving data, data preparation, data exploration, data modelling, Presentation and automation.	<b>15</b>
<b>II</b>	Introduction to Programming: Sequence data: string, list, dictionary, array and tuple. Tools for Data Science 2.1 Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK 2.2 Visualizing Data: Bar Charts, Line Charts, Scatter plots 2.3 Working with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction	15
<b>III</b>	Mathematical Foundations Mathematical Foundations 3.1 Linear Algebra: Vectors, Matrices, 3.2 Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation  3.3 Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem 3.4 Hypothesis and Inference:	15



	Statistical Hypothesis Testing, Confidence Intervals, P-hacking, Bayesian Inference	
<b>IV</b>	<p>Application of Data Science Complete development of an application using data science techniques like Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment</p> <p>Analysis.: Exploratory data analysis, data visualization on data set, Prediction, analysis and accuracy of the system.</p>	15

### PART-C: Learning Resources

#### Text Books, Reference Books and Others

- 1) Jain V.K., “Data Sciences”, Khanna Publishing House, Delhi.
- 2) Jain V.K., “Big Data and Hadoop”, Khanna Publishing House, Delhi.
- 3) Jeeva Jose, “Machine Learning”, Khanna Publishing House, Delhi.
- 4) Chopra Rajiv, “Machine Learning”, Khanna Publishing House, Delhi.
- 5) Ian Good fellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press  
<http://www.deeplearningbook.org>
- 6) Han and Jian Pei, "Data Mining Concepts and Techniques
- 7) NPTEL course on “ Data science using python”

### PART -D: Assessment and Evaluation

#### Suggested Continuous Evaluation Methods:

Maximum Marks: 100 marks

Continuous Internal Assessment (CIA): 30 Marks.

End Semester Exam (ESE): 70 marks

<b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>	<b>Internal test/Quiz:-20 &amp; 20 Assignment /seminar-10 Total marks:-30</b>	<b>Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.</b>
<b>End Semester Exam (ESE):</b>	<p>Two section- A&amp;B</p> <p><b>Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks</b></p> <p><b>Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks</b></p>	



<b>PART-A: Introduction</b>			
<b>Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)</b>		<b>Semester-II</b>	<b>Session: 2024-2028</b>
<b>Course Code</b>	<b>MCA305</b>		
<b>Course Title</b>	<b>Natural Language Processing</b>		
<b>Course Type</b>	<b>Elective Course</b>		
<b>Prerequisite</b>	As per program		
<b>Course Learning Outcomes (CLO)</b>	<b>At the end of this course, the students will be able</b> 1. To introduce the fundamental techniques of natural language processing. 2. To develop an understanding of the limits of those techniques. 3. Current research issues, and to evaluate some current and potential applications.		
<b>Credit Value</b>	<b>4 Credits</b>	<b>Credit-15 Hours - Learning &amp; Observation</b>	
<b>Total Marks</b>	<b>Max. Marks:100</b>	<b>Min marks -40</b>	
<b>PART -B: Content of the Course</b>			
<b>Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)</b>			
<b>Unit</b>	<b>Topics(Course Content)</b>	<b>No. of Period</b>	
<b>I</b>	I Grammars and Parsing: Grammar and sentence structure, good grammar, top-down and bottom-up chart parser, transition network grammars, finite state models and morphological processing, grammar and logic programming.	<b>15</b>	
<b>II</b>	Features and unification: Human preferences in parsing, encoding uncertainty: shift- Reduce Parsers, A deterministic Parser, Techniques for efficient encoding of ambiguity, semantics and logical form, word senses and ambiguity, partial parsing, feature stems and augmented grammars, some basic feature systems for English, morphological analysis and the lexicon, parsing with features, augmented transition networks, definite clause grammars, generalized feature systems and unification grammars	15	
<b>III</b>	- III Linking syntax and semantics:  Semantics and logical form, word senses and ambiguity, the basic logical form language, encoding ambiguity in the logical form, verbs and states in logical form, thematic roles, speech acts and embedded sentences, defining semantic structure: Model theory, semantic interpretation and compositionality, a simple grammar and lexicon with semantic interpretation, prepositional phrases and verb phrases, lexicalized semantic interpretation and semantic roles. Semantics	15	



	interpretation using feature unification, generating sentences from logical form.	
<b>IV</b>	Selection restrictions, semantic filtering using selection restrictions, semantic networks, statistical wordsense disambiguation, statistical semantic preferences, combining approaches to disambiguation, grammatical relations, semantic grammars, template matching, semantically driven parsing techniques, scooping phenomena, descriptions and scooping, scooping with parsing, co-reference and binding constraints, adjective phrases, relational nouns and nominalizations.	15

### PART-C: Learning Resources

**Text Books, Reference Books and Others**

1. Speech and Language Processing, Daniel Jurafsky & James H. Martin, LPE, Pearson Education.
2. Natural Language Understanding, James Allen, 2nd edition, Pearson Education.
3. Natural language processing in prolog, G.Gazder, Benjamin/cunnings

### PART -D: Assessment and Evaluation

**Suggested Continuous Evaluation Methods:**

Maximum Marks: 100 marks

Continuous Internal Assessment (CIA): 30 Marks.

End Semester Exam (ESE): 70 marks

<b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>	<b>Internal test/Quiz:-20 &amp; 20 Assignment /seminar-10 Total marks:-30</b>	<b>Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.</b>
<b>End Semester Exam (ESE):</b>	<b>Two section- A&amp;B Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit- 4x10=40 marks</b>	



<b>PART-A: Introduction</b>		
<b>Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)</b>		<b>Semester-II</b>
<b>Session: 2024-2028</b>		
<b>Course Code</b>	<b>MCA305</b>	
<b>Course Title</b>	<b>Artificial intelligence</b>	
<b>Course Type</b>	<b>DSC(Discipline Specific Course)</b>	
<b>Prerequisite</b>	As per program	
<b>Course Learning Outcomes (CLO)</b>	<p><b>At the end of this course, the students will be able</b></p> <ol style="list-style-type: none"> <li>1. To give an understanding of fundamentals algorithm for output primitive</li> <li>2. To make students learn what type of operation can be applied on graphical object and how they are applied</li> <li>3. To give an understanding of surface rendering for realistic images for developing graphical application</li> <li>4. To give learner an understanding of basic Knowledge of image processing for computer vision.</li> <li>5. To give an understanding about finding of different research areas in Image Processing and compression techniques.</li> </ol>	
<b>Credit Value</b>	<b>4 Credits</b>	<b>Credit-15 Hours - Learning &amp; Observation</b>
<b>Total Marks</b>	<b>Max. Marks:100</b>	<b>Min marks -40</b>
<b>PART -B: Content of the Course</b>		
<b>Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)</b>		
<b>Unit</b>	<b>Topics(Course Content)</b>	<b>No. of Period</b>
<b>I</b>	Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.	<b>15</b>
<b>II</b>	Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems -Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games	<b>15</b>
<b>III</b>	Knowledge Representation First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories -	<b>15</b>



	Reasoning with Default Information	
<b>IV</b>	Applications AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving	<b>15</b>

### **PART-C: Learning Resources**

#### **Text Books, Reference Books and Others**

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.
2. Artificial Intelligence: A Modern Approach, 4th Edition, Stuart Russell, peter Norvig University of California at Berkeley, Pearson education, 2020.
3. I. Bratko, —Prolog: Programming for Artificial Intelligence, Fourth Edition, Addison-Wesley Educational Publishers Inc., 2011.

### **PART -D: Assessment and Evaluation**

#### **Suggested Continuous Evaluation Methods:**

Maximum Marks: 100 marks

Continuous Internal Assessment (CIA): 30 Marks.

End Semester Exam (ESE): 70 marks

<b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>	<b>Internal test/Quiz:-20 &amp; 20 Assignment /seminar-10 Total marks:-30</b>	<b>Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.</b>
<b>End Semester Exam (ESE):</b>	<b>Two section- A&amp;B Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit- 4x10=40 marks</b>	

**MCA**  
**SEMESTER-IV**  
**Programme Curriculum**

S. No	Course Code	Course Title	Teaching Hours Per Week				Examination Scheme				
			L	T	P	C	Theory		Practical		Total Marks
							EX	IN	EX	IN	
1.	MCA401	Seminar on Project	3	1	0	4	-	-	50	50	100
2.	MCA402	Bigdata Analytics	3	1	0	4	70	30	-	-	100
3.	MCA403	Industrial Internship and Major Project	0	0	0	8	-	-	100	300	400
4.	MCA404	Machine Learning	3	1	-	4	70	30	-	-	100
<b>Total Contact Hours Per Week:20</b>		<b>Total Credit:</b>				<b>20</b>	<b>Total Mark</b>				<b>600</b>

<b>PART-A: Introduction</b>		
<b>Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)</b>	<b>Semester-II</b>	<b>Session: 2025-2027</b>
<b>Course Code</b>	<b>MCA402</b>	
<b>Course Title</b>	<b>Bigdata Analytics</b>	
<b>Course Type</b>	<b>DSC (Discipline Specific Course)</b>	
<b>Prerequisite</b>	As per program	
<b>Course Learning Outcomes (CLO)</b>	<p><b>At the end of this course, the students will be able</b></p> <ol style="list-style-type: none"> <li>1) To explore the fundamental concepts of big data analytics and visualization techniques.</li> <li>2) To learn to use various techniques for mining data stream.</li> <li>3) To understand big data analytics technology Hadoop concepts.</li> <li>4) To understand the Hadoop Framework and various big data enabling Technologies.</li> <li>5) To understand Open-Source Database Concepts.</li> <li>6) The students will be able to understand the Big Data Analytics fundamental concepts and visualization techniques.</li> <li>7) The students will be able to understand various techniques used for mining data stream.</li> <li>8) The students will be able to understand Hadoop Concepts.</li> <li>9) The students will be able to Know Hadoop frameworks and big data enabling Technologies.</li> <li>10) The students will be able to understand about concepts of Open-Sourcedatabases such as NOSQL, HBase etc.</li> </ol>	
<b>Credit Value</b>	<b>4 Credits</b>	<b>Credit-15 Hours - Learning &amp; Observation</b>
<b>Total Marks</b>	<b>Max. Marks:100</b>	<b>Min marks -40</b>
<b>PART -B: Content of the Course</b>		
<b>Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)</b>		
<b>Unit</b>	<b>Topics (Course Content)</b>	<b>No. of Period</b>
<b>I</b>	INTRODUCTION TO BIG DATA: Introduction to Big Data, Characteristics of Big Data , Sources of Big Data, Challenges of Conventional Systems, Analysis vs Analytics, Types of Data Analytics, Analysis vs Reporting, Visualizations - Visual data analysis techniques. Case studies of application Big Data.	<b>15</b>
<b>II</b>	MINING DATA STREAMS: Introduction To Streams Concepts, Stream Data Model and Architecture Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Counting Oneness in a Window, Decaying Window	<b>15</b>

<b>III</b>	HADOOP: Components of Hadoop, The Hadoop Distributed File System, Map Reduce, YARN, COMMON, Hadoop Cluster, How Map Reduce Works, Anatomy of a Map Reduce, Job Scheduling, Shuffle and Sort Map Reduce Types and Formats, Map Reduce Features	<b>15</b>
<b>IV</b>	Introduction to NoSQL Document Databases, Key Valued Databases, Column based Databases and Graph Databases. Issues of availability and consistency, CAP Theorem, Case studies of MongoDB, Neo4j, HBase, Cassandra, Memcached and Redis	<b>15</b>

### **PART-C: Learning Resources**

#### **Text Books, Reference Books and Others**

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012

### **PART -D: Assessment and Evaluation**

#### **Suggested Continuous Evaluation Methods:**

Maximum Marks: 100 marks

Continuous Internal Assessment (CIA): 30 Marks.

End Semester Exam (ESE): 70 marks

<b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>	<b>Internal test/Quiz:-20 &amp; 20 Assignment /seminar-10 Total marks: -30</b>	<b>Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.</b>
<b>End Semester Exam (ESE):</b>	<b>Two section- A&amp;B Section A: Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit- 4x10=40 marks</b>	

<b>PART-A: Introduction</b>		
<b>Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)</b>	<b>Semester-II</b>	<b>Session: 2025-2027</b>
<b>Course Code</b>	<b>MCA404</b>	
<b>Course Title</b>	<b>Machine Learning</b>	
<b>Course Type</b>	<b>DSC(Discipline Specific Course)</b>	
<b>Prerequisite</b>	As per program	
<b>Course Learning Outcomes (CLO)</b>	<b>At the end of this course, the students will be able</b> <ol style="list-style-type: none"> <li>1. To understand pattern classification algorithms to classify multivariate data</li> <li>2. To understand the Implementation of genetic algorithms</li> <li>3. To gain knowledge about Q-Learning</li> <li>4. 4. To create new machine learning techniques</li> </ol>	
<b>Credit Value</b>	<b>4 Credits</b>	<b>Credit-15 Hours - Learning &amp; Observation</b>
<b>Total Marks</b>	<b>Max. Marks:100</b>	<b>Min marks -40</b>
<b>PART -B: Content of the Course</b>		
<b>Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)</b>		
<b>Unit</b>	<b>Topics(Course Content)</b>	<b>No. of Period</b>
<b>I</b>	BASICS Learning Problems Perspectives and Issues Concept Learning Version Spaces and Candidate eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search	<b>15</b>
<b>II</b>	NEURAL NETWORKS AND GENETIC ALGORITHMS: Neural Network Representation Problems Perceptions Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms Hypothesis Space Search– Genetic Programming – Models of Evolutions and Learning.	<b>15</b>
<b>III</b>	BAYESIAN AND COMPUTATIONAL LEARNING: Bayes Theorem Concept Learning Maximum Likelihood Minimum Description Length Principle Bayes Optimal Classifier Gibbs Algorithm Naïve Bayes Classifier Bayesian Belief Network EM Algorithm Probability Learning Sample Complexity Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	<b>15</b>
<b>IV</b>	ADVANCED LEARNING: Learning Sets of Rules Sequential Covering Algorithm Learning Rule Set First Order Rules Sets of First Order Rules Induction on Inverted Deduction Inverting Resolution Analytical Learning Perfect Domain Theories Explanation Base Learning – FOCL Algorithm -	<b>15</b>

	Reinforcement Learning Task Learning Temporal Difference Learning	
<b>PART-C: Learning Resources</b>		
<b>Text Books, Reference Books and Others</b>		
<ol style="list-style-type: none"> <li>1. Tom M. Mitchell, "Machine Learning", McGraw-Hill, 2010</li> <li>2. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995</li> <li>3. Ethem Alpaydin, (2004)</li> <li>4. "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press</li> <li>5. T. astie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer(2nd ed.), 2009</li> </ol>		
<b>PART -D: Assessment and Evaluation</b>		
<b>Suggested Continuous Evaluation Methods:</b>		
Maximum Marks: 100 marks		
Continuous Internal Assessment (CIA): 30 Marks.		
End Semester Exam (ESE): 70 marks		
<b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>	<b>Internal test/Quiz:-20 &amp; 20 Assignment /seminar-10 Total marks: -30</b>	<b>Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.</b>
<b>End Semester Exam (ESE):</b>	<b>Two section- A&amp;B</b> <b>Section A: Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks</b> <b>Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks</b>	

<b>PART-A: Introduction</b>		
<b>Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)</b>	<b>Semester-II</b>	<b>Session: 2025-2027</b>
<b>Course Code</b>	<b>MCA403</b>	
<b>Course Title</b>	<b>Industrial Internship and Major Project</b>	
<b>Course Type</b>	<b>DSC (Discipline Specific Course)</b>	
<b>Prerequisite</b>	As per program	
<b>Course Learning Outcomes (CLO)</b>	<p><b>At the end of this course, the students will be able</b></p> <ol style="list-style-type: none"> <li>1. Identify and analyse a real-world problem and formulate it into a software development project.</li> <li>2. Design and implement a complete software system using appropriate technologies and development methodologies.</li> <li>3. Apply concepts from programming, databases, networking, and system design in project development.</li> <li>4. Evaluate system performance, testing strategies, and project outcomes.</li> <li>5. Prepare a professional project report and present the developed system through seminar and viva.</li> </ol>	
<b>Credit Value</b>	<b>4 Credits</b>	<b>Credit-15 Hours - Learning &amp; Observation</b>
<b>Total Marks</b>	<b>Max. Marks:100</b>	<b>Min marks -40</b>
<b>PART -B: Content of the Course</b>		
<b>Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)</b>		
<b>Topics (Course Content/Guidelines)</b>		
<ol style="list-style-type: none"> <li>1. Students are required to take up individual project in companies/Organizations/PSU/Govt.</li> <li>2. Project should be real time work.</li> <li>3. Project work may be application oriented or research oriented as per student interest.</li> <li>4. Therefore, the project reports will vary depending on whether it is application-oriented project or research-based project.</li> <li>5. Regular project work weekly dairy should be maintained by the students.</li> <li>6. Seminars / presentation should be given at Project Completion levels.</li> <li>7. Project verification at the place of project work is mandatory by the internal guide, for completion of the work.</li> <li>8. If project report is not as per the format and not a real time project, external guides will have every right to reject the project</li> <li>9. Students are encouraged and appreciated to show their project code demo along with their power point slide show during their viva exams as an added advantage.</li> </ol>		
<b>PART -D: Assessment and Evaluation</b>		

**Suggested Continuous Evaluation Methods:**

Maximum Marks: 100 marks

Continuous Internal Assessment (CIA): 30 Marks.

End Semester Exam (ESE): 70 marks

<b>Continuous Internal Assessment (CIA): (By Course Teacher)</b>	<b>Internal test/Quiz:-20 &amp; 20 Assignment /seminar-10 Total marks: -30</b>	<b>Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.</b>
<b>End Semester Exam (ESE):</b>	<b>Two section- A&amp;B Section A: Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit- 4x10=40 marks</b>	