M.C.A. II year Semester: III

Sr. No.	Course/Subject Name	Course	Examination Schema				Total Marks
			Max. Marks (Theory/Practical)	Max-Marks (Internal)	Total Marks	Min. Passing Marks	
1	Big Data Analytics	3T1	80	20	100	40	100
2	Data Mining	3T2	80	20	100	40	100
3	Python Programming	3T3	80	20	100	40	100
4	Artificial Intelligence	3T4	80	20	100	40	100
5	Soft Computing	3T5	80	20	100	40	100
6	Practical I based on Paper 1,2,3	3P1	100	**--**	100	40	100
7	Practical II based on Paper 4,5	3P2	100	**--**	100	40	100

M.C.A. II year Semester: IV

Sr. No.	Course/Subject Name	Course	Examination Schema				Total Marks
			Max. Marks (Theory)	Max-Marks (Internal)	Total Marks	Min. Passing Marks	
1	Project Work - Full Time	3T1	80	20	100	40	100
2	Seminar	3T2	80	20	100	40	100

Second Year M.C.A. Semester III (CBCS)

Core

Paper 1 - 3T1 **Credits: 4**

Big Data Analytics

Unit 1:

Getting an Overview of Big Data: What is Big Data, History of Data management, Structuring Big data, Elements of Big data, Big data Analytics, Advantages of Big data Analytics Exploring The Use of Big data. **Introducing Technologies for Handling Big data**: Distributed and Parallel Computing in Big Data, Introducing Hadoop, HDFS and Map reduce, Cloud computing and big data, Features of Cloud Computing.

Understanding Hadoop Ecosystem: Hadoop Ecosystem, Hadoop Distributed file system, HDFS Architecture, HDFS Commands, Mapreduce, Hadoop YARM, Introducing HBase, HBase Architecture, Combining HBase and HDFS, Hive, Pig and Pig latin, Sqoop, Zookeeper, Flume, Oozie. **Understanding MapReduce Fundamentals and HBase:** The MapReduce Framework, Exploring the Features of MapReduce, Working of MapReduce, Techniques to Optimize MapReduce Jobs, Uses of MapReduce.

Unit 2:

Understanding Big Data Technology Foundation: Exploring The Big data Stack, Data Source Layer, Ingestion Layer, Storage Layer, Physical Infrastructure Layer, Platform Management Layer, Security Layer, Monitoring Layer, Visualization Layer, Big Data Applications, Virtualization and Big Data, Virtualization Approaches **Storing Data In Data Bases and Data Warehouses:** RDBMS and Big Data**,** CAP Theorem, Issues with Relational Model, Non- Relational Database, Issues with Non-Relational Model, Integrating Big Data with Traditional Data Warehouses.

Unit 3:

Exploring R: Exploring Basic Features of R, Statistical Features, Packages, Graphical User Interfaces, R Console, Developing a Programme, Exploring R Studio, Basic Arithmetic in R, Variables and Functions in R, Handling Data in R Workspace **Reading DataSets and Exporting Data from R:** Using c() Command, Using scan() Command, Reading Mutiple Data values from Large Files, Reading Data from RStudio, Exporting Data from R. **Manipulating and Processing Data In R:** Creating Data Subsets, Merging Data Sets in R, Sorting Data, Managing Data in R using Matrices, Managing Data in R using Data Frames. **Working with Fuctions and Packages in R**:Using Functions instead of Scripts, Using Arguments in Functions, Built in Functions in R, Introducing Packages, Working with Packages. **Performing Graphical Analysis in R**:Using Plots, Saving Graphs to External Files, Advance Features of R.

Unit 4:

Data Visualization : Ways of Representing Visual Data, Techniques, Types, Applications, Visualizing Big Data, Tools used in Data Visualization **Social Media Analytics and Text Mining:** Introducing Social Media**,** Introducing Text Mining, Understanding Text Mining Processes, Sentiment Analysis **Mobile Analytics**: Introducing Mobile Analytics, Define

Mobile Analytics, Introducing Mobile Analytics Tools, Performing Mobile Analytics, Challenges of Mobile Analytics.

Books:

1. Big Data (Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization)
   Black Book, DT Editorial Services, Dreamtech Press.
2. Data Science & Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data EMC Education Services, WILEY Publication
3. Beginners Guide for Data Analysis using R Programming, Jeeva Jose, Khanna Publi.
4. Data Analytics, Maheshwari, McGraw
5. Hands-On Programming with R by Grolemund and Garrett
6. Beginning R: The Statistical Programming Language by Mark Gardener

Second Year M.C.A. Semester III (CBCS)

Core

Paper 2 - 3T2 **Credits: 4**

Data Mining

Unit 1:

Introduction to Data Mining: What is Data Mining? Motivating Challenges, Definitions, Origins of Data Mining, Data Mining Tasks, **Data:** Types of Data- Attributes and Measurement and Types of data sets, Data Quality-Measurement and Data Collection Issues, Issues Related to Applications, Data Preprocessing- Aggregation, Sampling, Dimensionality Reduction, Feature subset selection, Feature creation, Discretization and Binarization, Variable Transformation.

Unit 2:

Exploring Data: The Iris Data Set, Summary Statistics- Frequencies and Mode, Percentiles, Measures of Location: Mean and Median, Measures of Spread: Range and Variance, Multivariate Summary Statistics,Visualization: Representation, Arrangement, Selection, Visualization Techniques: Histograms, Box Plots, Scatter Plots, Contour Plots, Matrix Plots, Parallel Coordinates, Visualizing Higher-Dimensional data, OLAP and Multidimensional data Analysis, **Classification: Basic Concepts, Decision Trees, and Model Evaluation**: Preliminaries, General Approach to Solving Classification Problem, Decision Tree Induction, Evaluating the Performance of a Classifier, Methods for Comparing Classifiers.

Unit 3:

Classification: Alternative Techniques: Rule-Based Classifier, Rule Ordering Schemes, Building Rules-Based Classifier, Nearest Neighbor Classifiers, Bayesian Classifiers, Naive Bayes Classifier, Artificial Neural Networks (ANN), Support Vector Machines.

Association Analysis: Basic Concepts and Algorithms: Problem Definition, Frequent Itemset Generation- Apriori Principle, Candidate Generation and Pruning, Support Counting, Computational Complexity, Rule Generation, Compact Representation of Frequent Itemsets, Alternative Methods for Generating Frequent Itemsets, FP-Growth Algorithm, FP-Tree Representation.

Unit 4:

Cluster Analysis: Basic Concepts and Algorithms: What is Cluster Analysis? Different Types of Clustering, Types of Clusters, Clustering Algorithms: K-means and its variants, Hierarchical clustering, Density based clustering. Graph-Based Clustering, Shared Nearest Neighbor Approach, Jarvis Patrick Clustering, SNN Density-Based Clustering, **Anomaly Detection:** Causes of Anomaly Detection, Approaches to Anomaly Detection, Statistical Approaches, Proximity-Based Outlier Detection, Density-based Outlier Detection, Clustering-Based Techniques.

Books:

1. Introduction to Data Mining , Tan, Steinbach, Kumar.
2. Data Mining: Concepts and Techniques , Jiawei Han, MichelineKamber, Morgan Kaufmann
3. Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten and Eibe Frank, Morgan Kaufmann
4. Principles of Data Mining: David Hand, HeikkiMannila and Padhraic Smyth, PHP

Second Year M.C.A. Semester III (CBCS)

Core

Paper 3 - 3T3 **Credits: 4**

Python Programming

Unit 1 :

Introducing Python: What is Python? Python History, Similar Languages **Python Fundamentals: Extending Python programms:** Interactively, From a File, Other Methods, Script, program or module? **Components of a python programming: Built – In- Object types:** Python objects and other Languages,Operators basics, Numbers, Strings, Lists, Tuples, Working with Sequences, Dictionaries, Files, object storage, type conversion, type comparisons **Statements:** statement format, comments, assignments, print, control statements, common traps.

Functions: Function definition and execution, **scoping:** making objects global, the LGB Rule, scope traps, **Arguments:** Arguments are Objects, argument calling by Keywords, default arguments, argument tuples, argument dictionaries, function Rules, Return values, **Advanced Function calling:** The apply statement, the Map Statement, indirect function calls, anonymous functions, **Modules:** Importing a modules, Packages. **Object orientation:** Creating a Class **Exceptions and error trapping:** Exception handling, Built in exceptions.

Unit 2 :

Python's Built-In Functions: _import_(name[,globals [,locals [,fromlist]]]), apply(function, args, [,keywords]), getattr(object,name[,default]), hash(object), id(object), isinstance(object,class), list(sequence),setattr(object , name , value) , str(object) , type(object). **Interfacing to the OS :** Working with the system(sy module), Working with the Operating system(os module), Multithreading. **Processing Information :** Manipulating numbers,Text Manipulation,Time,Data types and Operator,Unicode strings.

Unit 3:

Working with Files: File processing:Reading,writing to file,changing position,Controlling File I/O: File Control, IO Control, File Locking, Getting File List,Basic File/Directory Management,Access and Ownership:Checking Access,Getting File information,Setting File Permissions,Manipulating File Paths**. Communicating over a network:** Creating a network server, client modulles,Handling internet data.**Using Python for multimedia**: Audio modules, Graphic Modules

Using Python as RAD Tool: What RAD realy is, Why Python **Application development with Python:**Integrated Development Enviornment**,** Python standard Library. **Distributing Python Modules**: Using Distutils,future features.

Unit 4 :

Web Development Basics: Writing HTML,Uniform Resource Locators,Dynamic Websites using CGI, Cookies, **Security Standard Markup Language Processing**: Processing SGML,Processing HTML,Processing XML. **Other Python Web Tools**: Zope,the Z-Objects

Publishing Enviorment,Jython,Python.Net,Python Server Pages,Python And Active Script,MailMan,Grail,Apache and Python,Socket Server and Base HTTP Server,Medusa.
Paths to Cross Platform Development: Basic Platform Support, Execution Envioritment,Line Termination,Character sets, Files and Pathnames. **The Python Architecture**:**Namespaces, Code blocks and Frames**:Code Blocks,Frames,Namespaces,Tracebacks,putting it together, **Built in types**:Callable object types,Modules,Classes, Class Instances,Internal Types, **Byte Code**: Python bytecode, bytecode disassembly,byte code instructions(opcodes)

Books:

1. The Complete Reference Python, Martin C.Brown , Tata McGraw Hill Publication
2. Programming in Python3, Mark Summerfield
3. Beginning Python From Novice to Professional, Magnus Lie Hetland(Apress)
4. Taming Python by Programming, Jeeva Jose, Khanna Publi.
5. Introduction to Computing and Problem Solving with Python, Jeeva Jose, Khanna Publi.
6. Python Programming, Seema Thareja, Pearson.

Second Year M.C.A. Semester III (CBCS)
Core Elective 2 (CE2-1)
Paper 4 - 3T4 **Credits: 4**
Artificial Intelligence

Unit 1 :

AI problems, AI Techniques, Tic-tac-toe, Question Answering, Problem as a state space search, A water jug problem, production system, Control strategies, Heuristic Search, Problem Characteristics, Production system characteristics, Design of search programs,

AI Search techniques:- Depth-first, Breadth-first search, Generate-and-test, Hill climbing, Best-first search, Constraint satisfaction, Mean-ends-analysis, A* Algorithm, AO* algorithm.

Unit 2 :

Knowledge Representation:- Representations and mappings, Knowledge Representations, Issues in Knowledge Representation, Predicate Logic:- Representing Instance and Isa Relationships, Computable Functions and predicates, Resolution, Natural Deduction, Logic programming, Forward versus Backward Reasoning, Matching, Control knowledge.

Unit 3 :

Games playing: Minimax search procedure , adding alpha-beta cutoffs, additional refinements,

Planning:- Component of a planning system, Goal task planning, Nonlinear planning, Hierarchical Planning.

Unit 4 :

Understanding, Understanding as Constraint satisfaction, Natural Language Processing, Syntactic Processing, Unification grammars, Semantic Analysis, Parallel and Distributed AI, Psychological Modeling, Distributed Reasoning Systems

Books:

1. Artificial Intelligence , Elaine Rich, Mcgraw hill Inc.
2. Lisp Programming, Rajeo Sangal ,TMH
3. Artificial intelligence, Russell, Pearson.
4. Artificial Intelligence and Expert Systems , Jankiraman, Sarukes
5. A first course in Artificial intelligence, Deepak Khemani, McGraw hill.

Second Year M.C.A. Semester III (CBCS)

Core

Paper 5 - 3T5 **Credits: 4**

Soft Computing

Unit 1: Introduction of soft computing, soft computing vs hard computing. Soft computing techniques. Computational Intelligence and applications, problem space and searching: Graph searching, different searching algorithms like breadth first search, depth first search techniques, heuristic searching Techniques like Best first Search, A* algorithm, AO* Algorithms. Game Playing: Minimax search procedure, adding alpha-beta cutoffs, additional refinements, Iterative deepening, Statistical Reasoning: Probability and Bayes theorem, Certainty factors and Rules based systems, Bayesian Networks, Dempster Shafer theorem

Unit 2 : Neural Network: Introduction, Biological neural network: Structure of a brain, Learning methodologies. Artificial Neural Network(ANN): Evolution of, Basic neuron modeling , Difference between ANN and human brain, characteristics, McCulloch-Pitts neuron models, Learning (Supervised & Unsupervised) and activation function, Architecture, Models, Hebbian learning , Single layer Perceptron, Perceptron learning, Windrow-Hoff/ Delta learning rule, winner take all , linear Separability, Multilayer Perceptron, Adaline, Madaline, different activation functions Back propagation network, derivation of EBPA, momentum, limitation, Applications of Neural network**.**

Unit 3 : Unsupervised learning in Neural Network: Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Associative memory, hope field network and Bidirectional associative memory. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Introduction to Support Vector machine, architecture and algorithms, Introduction to Kohanan's Self organization map, architecture and algorithms

Unit 4 : Fuzzy systems: Introduction, Need, classical sets (crisp sets) and operations on classical sets Interval Arithmetics, Fuzzy set theory and operations, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Membership functions.
Fuzzy rule base system: fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic, fuzzification and defuzzification, Fuzzy associative memory. Fuzzy Logic Theory, Modeling & Control Systems

Books :

1. S.N. Shivnandam, "Principle of soft computing", Wiley India.
2. David Poole, Alan Mackworth "Computational Intelligence: A logical Approach" Oxford.
3. Eiben and Smith "Introduction to Evolutionary Computing" Springer
4. E. Sanchez, T. Shibata, and L. A. Zadeh, Eds., "Genetic Algorithms and Fuzzy Logic Systems: Soft Computing Perspectives, Advances in Fuzzy Systems - Applications and Theory", River Edge, World Scientific

Pattern of Question Paper

1. There will be four units in each paper.

2. Maximum marks of each theory paper will be 80.

3. Question paper will consist of five questions, each of 16 marks.

4. Four questions will be on four units with internal choice (One question on each unit)

5. Fifth question will be compulsory with questions from each of the four units having equal weightage and there will be no internal choice