Second Year M.C.A. Semester III(Master in Computer Application) (CBCS)												
Code	Theory / Practical	Teaching scheme (Hours / Week)			Credits	Examination Scheme						
						Duration in hrs.	Max. Marks		Total Marks	Minimum Passing Marks		
		Th	Pract	Total			External Marks	Internal Ass		Th	Pract	
Paper 1 Core	3T1 Big Data Analytics	4	-	4	4	3	80	20	100	40	-	
Paper 2 Core	3T2 Data Mining	4	-	4	4	3	80	20	100	40	-	
Paper 3 Core	3T3 Python Programming	4	-	4	4	3	80	20	100	40	-	
Paper 4 Core Elective 2	3T4 CE2-1 Artificial Intelligence CE2-2 Mobile Computing CE2-3 Machine Learning	4	-	4	4	3	80	20	100	40	-	
Paper 5 Core	3T5 Soft Computing	4	-	4	4	3	80	20	100	40	-	
Practical 1	3P1 based on 3T1, 3T2 and 3T3	-	7	7	4	3	100	-	100	-	40	
Practical 2	3P2 based on 3T4 and 3T5	-	7	7	4	3	100	-	100	-	40	
	TOTAL	20	14	34	28		600	100	700	350		

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Second Year M.C.A. Semester III(Master in Computer Application) (CBCS)												
Code	Theory / Practical	Teaching scheme (Hours / Week)			Credits	Examination Scheme						
						Duration in hrs.	Max. Marks		Total Marks	Minimum Passing Marks	
		Th	Pract	Total			External Marks	Internal Ass		Th	Pract
Paper 1 Core	3T1 Big Data Analytics	4	-	4	4	3	80	20	100	40	-
Paper 2 Core	3T2 Data Mining	4	-	4	4	3	80	20	100	40	-
Paper 3 Core	3T3 Python Programming	4	-	4	4	3	80	20	100	40	-
Paper 4 Core Elective 2	3T4 CE2-1 Artificial Intelligence CE2-2 Mobile Computing CE2-3 Machine Learning	4	-	4	4	3	80	20	100	40	-
Paper 5 Core	3T5 Soft Computing	4	-	4	4	3	80	20	100	40	-
Practical 1	3P1 based on 3T1, 3T2 and 3T3	-	7	7	4	3	100	-	100	-	40
Practical 2	3P2 based on 3T4 and 3T5	-	7	7	4	3	100	-	100	-	40
	TOTAL	20	14	34	28		600	100	700	350	

Second Year M.C.A. Semester III(CBCS)
Core
Paper 1 - 3T1   **Credits: 4**
Big Data Analytics

Unit1:

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.

Unit2:

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, VirtualizationApproaches**Storing Data In Data Bases and DataWarehouses:** RDBMS and BigData**,**CAP Theorem,Issues with Relational Model,Non-Relational Database, Issues with Non-Relational Model, Integrating Big Data with Traditional Data Warehouses.

Unit3:

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 withFuctions 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.

Unit4:

Data   Visualization: Ways   ofRepresentingVisual 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, KhannaPubli.
   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

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

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 withPython:**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 Enviorntment,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, KhannaPubli.
5. Introduction to Computing and Problem Solving with Python, Jeeva Jose, Khanna Publi.
6. Python Programming, Seema Thareja, Pearson.

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, Mcgrawhill Inc.
2. Lisp Programming,RajeoSangal,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 Elective 2 (CE2-2)
Paper 4 - 3T4   **Credits: 4**
Mobile Computing

Unit 1 :
Mobile Communications: An Overview: Mobile Communication, Mobile Computing, Mobile Computing Architecture, Mobile Devices, Mobile System Networks, Data Dissemination, Mobility Management, Security Mobile Devices and Systems: Mobile Phones, Digital Music Players, Handheld Pocket Computers, Handheld Devices: Operating Systems, Smart Systems, Limitations of Mobile Devices, Automotive Systems GSM and Similar Architectures: GSM-Services and System, Architecture, Radio Interfaces, Protocols, Localization, Calling Handover, Security, New Data Services, General Packet Radio Service, High-speed Circuit Switched Data, DECT

Unit 2 :
Wireless Medium Access Control and CDMA based Communication: Medium Access Control, Introduction to CDMA-based Systems, Spread Spectrum in CDMA Systems, Coding Methods in CDMA, IS-95 cdma One System, IMT- 20 0 0, i- m o d e , O F D M , Mobile IP Network Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunnelling and Encapsulation Route Optimization, Dynamic Host Configuration Protocol, Mobile Transport Layer, Conventional TCP/IP Transport, Layer Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Methods of TCP-layer Transmission for Mobile Networks, TCP Over 2.5G/3G Mobile Networks

Unit 3 :
Databases: Database Hoarding Techniques, Data Caching, Client-Server Computing and Adaptation, Transactional Models, Query Processing, Data Recovery Process, Issues relating to Quality of Service, Data Dissemination and Broadcasting Systems**:** Communication Asymmetry, Classification of Data-Delivery Mechanisms, Data Dissemination Broadcast Models, Selective Tuning and Indexing Techniques, Digital Audio Broadcasting, Digital Video Broadcasting, Data Synchronization in Mobile Computing Systems**:** Synchronization, Synchronization Software for Mobile Devices, Synchronization Protocols, SyncML Synchronization Language for Mobile Computing, Sync4J (Funambol), Synchronized Multimedia ,Markup Language (SMIL)

Unit 4 :
Mobile Devices Server and Management: Mobile Agent, Application Server, Gateways, Portals, Service Discovery, Device Management, Mobile File Systems, Security, Mobile Adhoc and Sensor Networks: Introduction to Mobile Ad-hoc Network, MANET, Wireless Sensor Networks, Applications Wireless LAN, Mobile Internet Connectivity, and Personal Area Network: Wireless LAN (WiFi) Architecture and Protocol Layers, WAP 1.1 and WAP 2.0, Architectures, XHTML-MP (Extensible Hypertext Markup Language Mobile Profile), Bluetooth-enabled Devices Network, Layers in Bluetooth Protocol, Security in Bluetooth Protocol, IrDA, ZigBee Mobile Application Languages XML, Java, J2ME, and Java Card: Introduction, XML, JAVA, Java 2 Micro Edition (J2ME), JavaCard, Mobile Operating Systems : Operating System PalmOS, Windows CE, Symbian OS, Linux for Mobile Devices 530 20

Books :

1. Mobile Computing, Raj Kamal, Oxford University Press
2. Mobile Communications Jochen Schiller, Addison-Wesley.
3. Handbook of Wireless Networks and Mobile Computing, Stojmenovic and Cacute, Wiley,
4. Mobile Computing , Talukdar, TMH
5. Applications with UML and XML, Reza Behravanfar, Cambridge University Press
6. Mobile Computing ,Brijesh K Gupta, Khanna Publi.

Core Elective 2 (CE2-3)
Paper 4 - 3T4   **Credits: 4**
Machine Learning

Unit1 :
 Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.

Unit 2 :
 Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multilayer Perceptron in Practice – Examples of using the MLP – Overview – Deriving BackPropagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

Unit 3 :
 Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map

Unit 4:
Dimensionality Reduction :Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process. **Graphical Models:**Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Method

Books:
1. Introduction to Machine Learning (Adaptive Computation and Machine Learning Series), EthemAlpaydin,Third Edition, MIT Press
2. Machine learning – Hands on for Developers and Technical Professionals, Jason Bell, Wiley
3. Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, Peter Flach,Cambridge University Press.
4. Deep Learning , Rajiv Chopra, Khanna Publi.
5. Machine Learning, V. K. Jain, Khanna Publi.

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