Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Master of Computer Applications
(Autonomous)

Scheme of Examination
&
Syllabus

For Semester pattern with Choice Based Credit System

in

Master of Computer Application (MCA)
Semester I , II, III and IV

(Under Faculty of Science and Technology)

Approved by the Board of Studies in Computer Application (Autonomous)

Effective from the session 2022-23 and phase wise

Table 1: Scheme of Teaching and Examination for First Semester M.C.A. (Master of Computer Application) Choice Based Credit System (CBCS)											
Paper	**Paper Code**	**Title of the Paper**	**Teaching**		**Examination Scheme**						
			Mode	**Hrs / week**	**Examination Duration (Hrs)**	**Maximum Marks**			**Minimum Passing Marks**	**Maximum Total Marks**	**Credits**
						Theory	**Practical**	**Internal Assessment**			
Core 1	ECCA 1T1	Advanced Java Programming	L/T	4	3	60	Nil	40	50	100	4
Core 2	ECCA 1T2	Data Communication and Network	L/T	4	3	60	Nil	40	50	100	4
Core 3	ECCA 1T3	Web Technologies	L/T	4	3	60	Nil	40	50	100	4
Core 4	ECCA 1T4	Advanced DBMS and Administration	L/T	4	3	60	Nil	40	50	100	4
Core 5	ECCA 1T5	Software Engineering	L/T	4	3	60	Nil	40	50	100	4
Practical	ECCA 1P1	Practical-I (based on ECCA 1T1, 1T2 and ECCA 1T3)	P	8	3	Nil	100	--	50	100	4
Practical	ECCA 1P2	Practical-II (based on ECCA 1T4 and 1T5)	P	8	3	Nil	100	---	50	100	4
		TOTAL		**36**		**300**	**200**	**200**	**350**	**700**	**28**

Table 2: Scheme of Teaching and Examination for Second Semester M.C.A. (Master of Computer Application) Choice Based Credit System (CBCS)											
Paper	**Paper Code**	**Title of the Paper**	**Teaching**		**Examination Scheme**						
			Mode	**Hrs / week**	**Examination Duration (Hrs)**	**Maximum Marks**			**Minimum Passing Marks**	**Maximum Total Marks**	**Credits**
						Theory	**Practical**	**Internal Assessment**			
Core 1	ECCA 2T1	C# and ASP.NET	L/T	4	3	60	Nil	40	50	100	4
Core 2	ECCA 2T2	Cloud Computing	L/T	4	3	60	Nil	40	50	100	4
Core 3	ECCA 2T3	Computer Graphics	L/T	4	3	60	Nil	40	50	100	4
Core 4	ECCA 2T4	**CE1-1** Computer Architecture and Organization **CE1-2** Operation Research **CE1-3** Cyber Forensics	L/T	4	3	60	Nil	40	50	100	4
Core 5	ECCA 2T5	Android Programming	L/T	4	3	60	Nil	40	50	100	4
Practical	ECCA 2P1	Practical-I (based on ECCA 2T1, ECCA 2T2 and ECCA 2T3)	P	7	3	Nil	100	--	50	100	4
Practical	ECCA 2P2	Practical-II (based on ECCA 2T4 and ECCA 2T5)	P	7	3	Nil	100	---	50	100	4
Project	ECCA 2P3	Project	P	3	3	Nil	100	---	50	100	4
		TOTAL		**37**		**300**	**300**	**200**	**400**	**800**	**32**

Table 1: Scheme of Teaching and Examination for Third Semester M.C.A. (Master of Computer Application) Choice Based Credit System (CBCS)											
Paper	**Paper Code**	**Title of the Paper**	**Teaching**		**Examination Scheme**						
			Mode	**Hrs / week**	**Examination Duration (Hrs)**	**Maximum Marks**			**Minimum Passing Marks**	**Maximum Total Marks**	**Credits**
						Theory	**Practical**	**Internal Assessment**			
Core 1	ECCA 3T1	Artificial Intelligence	L/T	4	3	60	Nil	40	50	100	4
Core 2	ECCA 3T2	Big Data Analytics	L/T	4	3	60	Nil	40	50	100	4
Core 3	ECCA 3T3	Machine Learning	L/T	4	3	60	Nil	40	50	100	4
Core 4	ECCA 3T4	**CE1-1** Mobile Computing **CE1-2** Soft Computing **CE1-3** Data Mining	L/T	4	3	60	Nil	40	50	100	4
Core 5	ECCA 3T5	Programming in Python	L/T	4	3	60	Nil	40	50	100	4
Practical	ECCA 3P1	Practical-I (based on ECCA 3T1,3T2 and 3T3)	P	8	3	Nil	100	--	50	100	4
Practical	ECCA 3P2	Practical-II (based on ECCA 3T4 and 3T5)	P	8	3	Nil	100	---	50	100	4
		TOTAL		**36**		**300**	**200**	**200**	**350**	**700**	**28**

Table 2: Scheme of Teaching and Examination for Fourth Semester M.C.A. (Master of Computer Application) Choice Based Credit System (CBCS)											
Paper	**Paper Code**	**Title of the Paper**	**Teaching**		**Examination Scheme**						
			Mode	**Hrs / week**	**Examination Duration (Hrs)**	**Maximum Marks**			**Minimum Passing Marks**	**Maximum Total Marks**	**Credits**
						Theory	**Practical**	**Internal Assessment**			
Paper-1	ECCA-PRJ	Project Work - Full Time	--	---	3	--	300	300	300	600	24
Paper-2	ECCA-SEM	Seminar	---	--	30 minutes	---	100	100	100	200	8
		TOTAL	**--**	**--**	**---**	**---**	**400**	**400**	**400**	**800**	**32**

Master of Computer Application (M.C.A.) - Semester I
First Year M.C.A. Semester I (CBCS)
Paper I- ECCA 1T1
Advanced Java Programming

Credits : 4 **Duration: 64 Hrs**

Course Objective:

To provide the knowledge of integrated development environment to write, compile, run, and test simple to advanced object-oriented Java programs.

Course Outcomes:

On completion of the course, the students should be able to:

CO1: Facilitates in understanding the concepts of object oriented programming. Skill enhancing through concepts like multithreading, abstraction, platform independence
CO2: implement platform independence, Applet programming
CO3: JDBC Architecture and RMI programming
CO4: Design Programs for JAVA Beans and Servlets

Unit 1 :

Java and Internet, Features of java: security, portability, multithreading, etc, Bytecode, Datatypes, variables and Arrays, Operators, **Classes** : declaring objects, methods, constructor, overloading constructor, garbage collection, finalize() method, static variable and method, final variable, command line argument. Inheritance: super keyword, final with inheritance. Packages and Interfaces, Wrapper classes, Exception handling : Overview, types, Uncaught exception, try - catch block, multiple catch, nested try, throw, throws, finally, bulit-in and user- defined exception.

Multithreading : Life Cycle, Thread class and Runnable Interface, isAlive(), join(),Priorites, Synchronization : sleep() , run(). Interthread communication : wait(), notify(), notifyAll(), deadlock. String Handling.

Unit 2:

Applet: Applet Class, Architecture, Life Cycle, Display methods, HTML APPLET Tag, Passing parameter to Applet

AWT : working with Windows, Controls, Layout Manager, Menus, Swings, Event handling.

Unit 3:

JDBC : Architecture, JDBC-ODBC bridge driver, SQL Package, ResultSet and its methods.

Networking : Socket, Reserve socket, Internet Addressing, InetAddress, TCP/IP client socket, TCP/IP server socket, URL, URL Connection, Datagram.

RMI : Introduction, Architecture, Remote Interface, java.rmi. server package, class naming, creating Rmi server and client ,transmitting files using rmi, client side callback, RMISECURITYMANAGER class, RMI Exception, Stub and Skeleton.

Unit 4:

Servlet : Life Cycle, Tomcat, javax. servlet package, reading servlet parameter, javax.servlet.http package, handling http request and response with HTTPGET and HTTPPOST, cookies,session tracking. **JSP** : Introduction, Types of JSP tags, Application using JSP and Servlet.

JavaBeans : Advantages of Beans, BDK, JAR files, Introspection, Developing Beans using BDK.

Books:

1. *The Complete Reference ,Java, Herbert Schildt , McGraw Hill TMH*
2. *Programming with Java , C Muthu ,McGraw Hill*
3. *Black Book on Java*
4. *https://www.geeksforgeeks.org/introduction-to-jsp/*

Reference Books:

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2. Introduction to Java programming, By Y.DanielLiang, Pearson Publication.

Master of Computer Application (M.C.A.) - Semester I
First Year M.C.A. Semester I (CBCS)
Paper II- ECCA 1T2
Data Communication and Network

Crdits : 4 **Duration: 64 Hrs**

Course Objective:

The main objective of data communication and networking is to enable seamless exchange of data between any two points also to understand network communication using the layered concept, Open System Interconnect (OSI) and the Internet Model..

Course Outcomes:

On completion of the course, the students should be able to:

CO1: understand and master the fundamentals of data communications through the knowledge of data transmission concepts, media used for data communication
CO2: know the different layer of OSI reference model
CO3: know the different network security algorithms
CO4: know the intrusion detection techniques and Authentication

Unit I :

Introduction: Network structure and architectures and services OSI reference model.
The Physical Layer: theoretical basis for data communication, transmission media. Analog Transmission, Digital Transmission, Transmission and Switching, ISDN.
The Data Link Layer: Design issues, Error detection and correction, Elementary data link protocols, sliding window protocol, protocols performance, protocols specification and verification. Examples of the Data link layer.
Network Layer: Design issues, routing algorithms, Congestion control algorithms, Internet working, Examples of the network layer.

Unit II :

The Transport Layer: Design issues, Connection Management.
The session layer: Design issues and remote procedure call.
The Presentation Layer: Design issues, data compression techniques, cryptography.
The Application Layer: Design issues, file transfer, access and management, virtual terminals.

Unit III :

Network Security Fundamentals: Introduction, security Vulnerabilities and Threats, Classification of Security Services. Cryptography: Encryption principles, Conventional Encryption DES, IDEA, Algorithms, CBC, Location of Encryption Devices key Distribution.

Unit IV :

Message Digests and Checksums, Message Authentication, Message Digests, Hash Functions and SHA, CRCs. Public key Systems: RSA Diffie-Heliman, DSS, Key Management.
Intruders: Intrusion Techniques, Intrusion Detection, Authentication, Password- Based Authentication, Address- Based Authentication, Certificates, Authentication Services, Email Security, Firewalls, Design Principles, Packet Filtering, Access Control, Trusted Systems, Monitoring and Management.

Books :

1. Computer Networks , Andrew S Tanenbum ,PHI
2. Network Security and Essentials: Application and standers ,Willam Stalling, Pearson
3. Cryptography and network security , Willam Stalling , Pearson Education.
4. Data Communication and Networking, Behrouz A. Forouzan, TMH.

Master of Computer Application (M.C.A.) - Semester I
First Year M.C.A. Semester I (CBCS)
Paper III- ECCA 1T3
Web Technologies

Credits : 4 **Duration: 64 Hrs**

Course Objective:

The objective is to study every aspect of various Web technologies, such as PHP, HTML and JavaScripts. Build dynamic web pages using JavaScript (Client side programming). Students will gain the skills and project-based experience needed for entry into web application and development careers.

Course Outcomes:

On completion of the course, the students should be able to:

CO1: understand and master the fundamentals HTML and JavaScript.

CO2: become familiar with client server architecture and able to develop a web application using various technologies. To understand and develop a web-based application using a framework concept

CO3: gain the skills and project-based experience needed for entry into web application and development careers

CO4: become expert in Web page development using PHP

Unit-I

HTML Programming: HTML, Working with list , Working with images, Introduction to forms ,Working with frames, Introduction to cascading style sheets.

JavaScript programming : Introducing JavaScript , Client side benefits of using JavaScript over VB script, Embedding JavaScript in an HTML Page, handling events , Using variables in JavaScript, using arrays in JavaScript, creating objects in JavaScript , Using operators, Working with control statements, Working with functions , Introducing DHTML

Unit-II

Introduction : A Brief History of PHP, PHP Language Basics: Lexical Structure, Data Types, Variables, Expressions and Operators Flow- Control Statements Including Code, Embedding PHP in Web Pages,

Functions: Calling a Function, Defining a Function, Variable Scope, Function Parameters, Return Values, Variable Functions, Anonymous Functions, Strings: Quoting String Constants, Printing Strings, Accessing Individual Characters, Cleaning Strings, Encoding and Escaping, Comparing Strings, Manipulating and, Searching Strings Regular Expressions, POSIX- Style Regular Expressions, Perl- Compatible Regular Expressions, Arrays: Indexed Versus Associative Arrays, Identifying Elements of an Array, Storing Data in Arrays, Multidimensional Arrays, Extracting Multiple Values, Converting Between Arrays and variables, Traversing Arrays, Sorting, Acting on Entire Arrays, Using Arrays

Unit-III

Classes and Objects: Terminology, Creating an Object, Accessing Properties and Methods, Declaring a Class, Introspection, Serialization, Web Techniques: HTTP Basics, Variables, Server Variables, Server Information, Processing Forms, Setting Response Headers, Session, cookies, files, Maintaining State, SSL, Using PHP to Access a Database: Relational Databases and SQL, Mysql database Basics, Advanced Database Techniques

Unit-IV

Graphics : Embedding an Image in a Page, The GD Extension, Basic Graphics concepts, Creating and Drawing Images, Images with Text, Dynamically Generated Buttons, Scaling Images, Color Handling, **PDF:**PDF Extensions, Documents and Pages, Text, Images and Graphics, Navigation, Other PDF Features, **XML:** Lightning Guide to XML, Generating XML, Parsing XML, Transforming XML with SLT, Web Services, **Security:** Global Variables and Form Data, Filenames, File Uploads, File Permissions, Concealing PHP Libraries, PHP Code, Shell

Commands, Security Redux, Application Techniques, Code Libraries, Tinplating Systems, Handling Output, Error Handling, Performance Tuning.

Books :

1. Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, XML and AJAX, Black Book by Kogent Learning Solutions Inc. dreamtech press
2. PHP5.1for beginners , Evan Bayross and Sharman Shah, SPD Publications
3. Programming PHP , Rasmus Lerdorf and Kevin Tatroe, Orilly Publications

Master of Computer Application (M.C.A.) - Semester I
First Year M.C.A. Semester I (CBCS)
Paper IV- ECCA 1T4
Advanced DBMS and Administration

Credits : 4 **Duration: 64 Hrs**

Course Objective:

The objective is to understand the basic concepts and terminology related to DBMS and to understand advanced DBMS techniques to construct tables and write effective queries, forms, and reports. The overall objective of the DBA program is to become an expert in a certain area of a management field as a wider discipline and to strengthen your leadership skills by exploring a specific research field.

Course Outcomes:

On completion of the course, the students should be able to:

CO1: Can explore efficient method for handling multiple types of data
CO2: Have a detailed view of handling parallel and distributed database
CO3: normalize the database & understand the internal data structure
CO4: Deep visualization of realistic data into physical structure

Unit I :

Relational Database design: Functional dependencies, and Normalization Normal forms based on primary keys (1 NF, 2 NF, 3 NF, BCNF, 4 NF, 5 NF) Loss less joins and dependency preserving decomposition Query Processing: Query Processing Stages, Query Interpretation, Equivalence of Expressions, Query Resource Utilization, Query Execution Plan, Estimation of Query Processing Cost, Multiple Index Access, Methods for Joining Tables (Nested Loop, Multiple Join) Structure of a Query Optimizer

Unit II :

Transaction Processing & Concurrency Control: Concept and definition of transaction, ACID properties, serializibility, Prioritization, states of transaction, Types of failure, desirable properties of transaction schedules and recoverability, serial usability of schedules, levels of transaction consistency, deadlocks, long duration transactions, transaction performance, transaction processing as implemented in contemporary database, management system. Concurrency Control, locking techniques, techniques based on time-stamp ordering, multiple granularity. Crash Recovery**:** failure classification, recovery concepts, database backup, recovery concepts based on deferred update and on immediate update. Shadow paging, check points, crash recovery techniques. Client/Server database : Evolution of client concept, Client/Server environment, characterization of Client/Server computing. Functions of clients server , application partitioning, the two-layer and three-layer architectures, communication between clients and servers.

Unit III :

Oracle Database Architecture and Administration: Oracle database architecture, Design, Creation, Management of Oracle Databases and related database schemes, Data Dictionary views and standard package Maintaining the control, Redo Log files, Managing Table spaces and Data Files, Storage structure and relationships, Managing rollback segment, Indexes, Managing data Integrity, Managing password security and resources, Managing users, Privileges, roles. Oracle Backup and Recovery Strategies: Backup and recovery considerations, Oracle recovery structure and processes, Oracle backup and recovery configuration, Physical backup, Complete recovery of an Oracle database, Oracle Export / Import utilities, Oracle standby database.

Unit IV :

Oracle Tuning and Troubleshooting: Oracle performance tuning methodology, 'Oracle alert and trace files, Tuning the shared pool, Buffer Cache, Redo Log buffer, Database configuration and I/O issues, Using Oracle Blocks efficiently, Optimizing sort operations, Rollback segment tuning,

Monitoring and detecting lock contention, SQL issues and tuning considerations for different application. Integrity, Security: Need for Database Integrity, Integrity Constraints, Introduction to Database, Security issues.

Books :

1. *Fundamental of Database Systems , R. Elmasri S. Navathe Benjamin Cummings*
2. *Database system concept , Korth*
3. *Oracle 9i Performance Tuning, Joseph C. Johnson*
4. *DBA Handbook oracle press , Loney*

Master of Computer Application (M.C.A.) - Semester I
First Year M.C.A. Semester I (CBCS)
Paper V- ECCA 1T5
Software Engineering

Credits : 4 **Duration: 64 Hrs**

Course Objective:

The main objective of software engineering is to develop methods and procedures for software development that can scale up for large systems The objective is also to develop software engineering models, software engineering documents, software engineering data, software engineering reports, software engineering forms using management techniques that ensure quality software.

Course Outcomes:

On completion of the course, the students should be able to:

CO1: get detailed knowledge of role of software in daily basis.
CO2: identify different models and find out the best .
CO3: Test the developed software for high performance and maintainability.
CO4: Study the software measure parameters for software quality .

Unit I :

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths.
A Generic view of process : Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.
Process models : The waterfall model, Incremental process models, Evolutionary process models, The Unified process. Requirement Engineering **:** Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

Unit II :

Requirements engineering process : Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. System models : Context Models, Behavioral models, Data models, Object models, structured methods. Modeling with UML .
Design Engineering : Design process and Design quality, Design concepts, the design model.
Creating an architectural design : Software architecture, Data design, Architectural styles and patterns, Architectural Design.

Unit III :

Object-Oriented Design : Objects and object classes, An Object-Oriented design process, Design evolution. Performing User interface design : Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.
Testing Strategies : A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging. Product metrics **:** Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

Unit IV :

Metrics for Process and Projects **:** Software Measurement, Metrics for software quality.
Risk management **:** Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.
Quality Management : Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

Books :

1.Software Engineering, A practitioner's Approach, Roger S. Pressman, McGrawHill International Edition.
2. Software Engineering, Sommerville, Pearson education.
3. Software Engineering principles and practice, Waman S Jawadekar, McGraw-Hill.

Master of Computer Application (M.C.A.) - Semester II
First Year M.C.A. Semester II (CBCS)
Paper I ECCA 2T1
C# and ASP.NET

Credits : 4 **Duration: 64 Hrs**

Course Objective:

C# is a modern, general-purpose programming language that can be used to perform a wide range of tasks and objectives that span over a variety of professions . The original objective of the C# Programming language along with the .NET framework allow you to build applications on the Windows platform. ASP.NET is able to create Website, enhanced by using Master pages and Themes.

Course Outcomes:

On completion of the course, the students should be able to:

CO1: to study simple C# program structure
CO2: write C# program for classes, arrays, struct, array of objects
CO3: understand ASP.NET structure .
CO4: study Error handling, Component based programming

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Unit I:

Introduction to .NET, the origins of .NET, .NET framework overviews (a common substrate for all development, key design goals, Mega Data, Multiple language integration and support, Name spaces), .NET framework Base classes, User and program interfaces(user Interface, Windows Forms, Web Forms, Console application), Program interface, Web Services Introduction to Common Language Runtime (CLR) Requirement of .NET application (Assembly, Module, Type), common type systems (Custom types, Boxing & Unboxing value types), Metadata (Attributes, Custom Attributes), Managed Data (Managed Heap, Garbage collector), Garbage collector, optimization, pinning objects.

Unit II:

Introduction to C Sharp, Value type, Default Constructor, Struct type, Enumeration type, Reference type, Class Type, Object Type, String Type, Interface type, Array type, Delegate type, Predefined types, Concept of Boxing & Unboxing, Array types, Variables & Parameters, Operands, Statements. Expression, operators, C Sharp Objects, Classes and Methods, Inheritance, Garbage collector, Class library and Name Space, Method overloading, statements and control. Struct types, Struct declaration, Struct modifier, Struct Interface, Enums, Enumerator Base type, Enum modifiers, Enum Members, Enum values and operations, String operations, converting objects to string, String builder, File and folder operations, reading and writing text files, reading and writing binary files,

Unit III:

Introduction to ASP .NET - About ASP .NET, Basic difference between C# and VB .NET, **Understanding Namespaces and Assemblies -** Importing Namespaces, Assemblies. **Web Server and user -** Installing US. US Manager - Creating a virtual Director, Virtual Directories and Applications, Folder Settings, Adding virtual directory to your Neighborhood. **Installing ASP .NET. ASP.NET Applications -** ASP .NET file Types, The bin directory, Code-Behind, The Global.asax Code-Behind, Understanding ASP. Net Classes, ASP .NET Configuration, **Web Form Fundamentals -** A Simple Applets, Improving the Currency Converter, HTML Control classes, Page Class, Assessing HTML Server Controls. **Web Controls -** Basic Web Control classes, Auto Post Back and Web Control Events, A Web page Applets. **Validation and Rich Controls.**

UNIT IV:

State Management Tracing, Logging and Error Handling -Common errors, .NET Exception Object, Handling Exceptions, Throwing your own Exceptions, Logging Exceptions, Error pages, Page tracing. **Advanced ASP. NET -Component-Based Programming -** Components Jargon, Creating Simple Component, Properties and State, Database Components, Using COM Components. Custom Controls-User Controls, Deriving Custom controls. **Cashing and Performance tuning -** Designing fro scalability, Profiling, Caching, output Caching, Data caching. Implementing Security-Determining Security Requirements, The ASP .NET Security Model, Forms Authentication, Windows Authentication, Impersonation.

Books:

1. *C#(CSharp) Programming, V. K. Jain, Dreamtech Press, New Delhi.*
2. *Programming in C# , Balguruswamy, Tata McGraw Hill.*
3. *Introduction to DOT NET (.NET), James Conardet. Al., Shroff Publisher*
4. *Introducing Microsoft Dot Net , David Platt, PHI Publication.*
5. *C # (C Sharp) Complete Reference , Schildt, Tata McGraw Hill*
6. *The Complete Reference-ASP .NET , Matthew MacDonald,Tata McGraw- Hill.*
7. *ASP .NET 4.5(Covers C# and VB codes), Black Book, dreamtech Publication*

Master of Computer Application (M.C.A.) - Semester II
First Year M.C.A. Semester II (CBCS)
Paper II ECCA 2T2
Cloud Computing

Credits : 4 **Duration: 64 Hrs**

Course Objective:
The goal of cloud computing is to provide easy, scalable access to computing resources and IT services. Cloud infrastructures support environmental proactivity, powering virtual services rather than physical products and hardware, and cutting down on paper waste, improving energy efficiency.

Course Outcomes:
On completion of the course, the students should be able to:

CO1: become familiar with Cloud Computing and its ecosystem and learn basics of virtualization and its importance.

CO2: evaluate in-depth analysis of Cloud Computing capabilities and give technical overview of Cloud Programming and Services

CO3: understand security issues in cloud computing and exposed to Ubiquitous Cloud and Internet of Things

CO4: understand emerging trends in cloud computing

Unit I :
Origins and Influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges, Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models, Federated Cloud/Intercloud, Types of Clouds. Cloud-Enabling Technology: Broadband Networks and Internet Architecture, Data Center Technology, Virtualization Technology, Web Technology, Multitenant Technology, Service Technology.
Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

Unit II :
Common Standards: The Open Cloud Consortium, Open Virtualization Format, Standards for Application Developers: Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and LAPP),Syndication (Atom, Atom Publishing Protocol, and RSS), Standards for Security
Features of Cloud and Grid Platforms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments, Understanding Core OpenStack Ecosystem. Applications: Moving application to cloud, Microsoft Cloud Services, Google Cloud Applications, Amazon Cloud Services, Cloud Applications (Social Networking, E-mail, Office Services, Google Apps, Customer Relationship Management).

Unit III :
Basic Terms and Concepts, Threat Agents, Cloud Security Threats and Attacks, Additional Considerations. Cloud Security Mechanisms: Encryption, Hashing, Digital Signature, Public Key Infrastructure (PKI), Identity and Access Management (IAM), Single Sign-On (SSO), Hardened Virtual Server Images.
Cloud Issues: Stability, Partner Quality, Longevity, Business Continuity, Service-Level Agreements, Agreeing on the Service of Clouds, Solving Problems, Quality of Service, Regulatory Issues and Accountability.Cloud Trends in Supporting Ubiquitous Computing, Performance of Distributed Systems and the Cloud.

Unit IV :
Enabling Technologies for the Internet of Things (RFID, Sensor Networks and ZigBee Technology, GPS), Innovative Applications of the Internet of Things (Smart Buildings and Smart Power Grid, Retailing and Supply-Chain Management, Cyber-Physical System), Online Social and Professional Networking.

How the Cloud Will Change Operating Systems, Location-Aware Applications, Intelligent Fabrics, Paints, and More, The Future of Cloud TV, Future of Cloud-Based Smart Devices, Faster Time to Market for Software Applications, Home-Based Cloud Computing, Mobile Cloud, Autonomic Cloud Engine, Multimedia Cloud, Energy Aware Cloud Computing, Jungle Computing.Docker at a Glance: Process Simplification, Broad Support and Adoption, Architecture, Getting the Most from Docker, The Docker Workflow.

Books:

1. Jack J. Dongarra, Kai Hwang, Geoffrey C. Fox, Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Elsevier, ISBN :9789381269237, 9381269238, 1st Edition.
2. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture, Pearson, ISBN :978 9332535923, 9332535922, 1st Edition.
3. Srinivasan, J. Suresh, Cloud Computing: A practical approach for learning and implementation, Pearson, ISBN :9788131776513.
4. Brian J.S. Chee and Curtis Franklin, Jr., Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, CRC Press, ISBN :9781439806128.
5. Kris Jamsa, Cloud Computing: Saas, Paas, Iaas, Virtualization, Business Models, Mobile, Security, and More, Jones and Bartlett, ISBN :9789380853772.
6. John W. Ritting house, James F. Ransome, Cloud Computing Implementation, Management, and Security, CRC Press, ISBN : 978 1439806807, 1439806802.

Master of Computer Application (M.C.A.) - Semester II
First Year M.C.A. Semester II (CBCS)
Paper III ECCA 2T3
Computer Graphics

Credits : 4 **Duration: 64 Hrs**

Course Objective:
The course objective is to introduce students with fundamental concepts and theory of computer graphics. It provides the necessary theoretical background and demonstrates the application of computer science to graphics.

Course Outcomes:
On completion of the course, the students should be able to:

CO1: Provides user interfaces, data visualization, television commercials, motion pictures
CO2: Hardware devices and algorithms which are necessary for improving the effectiveness, realism, and speed of picture generation
CO3: Three dimensional graphic algorithm are incorporated in various streams to better simulate complex interactions
CO4: 3-d transformations, b-spline surfaces, curves, and hidden surfaces can be explored

Unit I :
Introduction of computer Graphics and its applications, Overview of Graphics systems, Video display devices, Raster scan display, Raster scan systems, video controller, Raster scan display processor, Random scan display, random scan systems, color CRT monitor, Flat panel display, Interactive input devices, Logical classification of input devices, Keyboard, mouse, Trackball and spaceball, Joysticks, Image scanner, Light pens, Graphics software, Coordinates representations, Graphics functions.

Unit II :
Line drawing algorithms, DDA, Bresenham's, Circle generating, Mid-point circle algorithm, Ellipse generating, Polygon , Scan-line polygon fill, Boundary fill.

Unit III :
Basic transformation's, Translation, Rotation, Scaling, Matrix representation's & homogeneous co-ordinates, Composite transformation's, Reflection, Two dimensional viewing, Two dimensional clipping, Line, Polygon, Curve, Text. 3D-transformation, Projection, Viewing, Clipping.
Spline representation, Cubic spline, Bezier curve, Bezier surfaces, Beta spline, B-spline surfaces, B-spline curve, Hidden surfaces, Hidden lines, Z-buffer.

Unit IV :
Fractal's geometry Fractal generation procedure, Classification of Fractal, Fractal dimension, Fractal construction methods. Color models, XYZ, RGB, YIQ, CMY & HSV, Shading algorithms, Shading model, Illumination model, Gouraud shading, Phong shading.

Books :
1. Computer Graphics ,M. Pauline Baker, Donald Hearn, PHI.
2. Mathematical Element for Computer Graphics , David F. Roger, J. Alan Adams, Tata McGHill.
3. Computer Graphics , Apurva Desai , PHI

Master of Computer Application (M.C.A.) - Semester II
First Year M.C.A. Semester II (CBCS)
Paper IV ECCA 2T4 (Elective-I)
Computer Architecture and Organization

Credits : 4 **Duration: 64 Hrs**

Course Objective:
The objective is to understand the structure, function and characteristics of computer systems and to understand the design of the various functional units and components of computers. To identify the elements of modern instructions sets and their impact on processor design

Course Outcomes:
On completion of the course, the students should be able to:
CO1: explore the fundamentals of Computer Architecture and Organization
CO2: understand the design of control unit
CO3: study the concepts of memory organization and to understand various memory technologies
CO4: understand the concepts of input output processing to interface various I/O devices

Unit I:
Organization of the CPU and main memory of the IAS computer, Structure of the IBM System/360.
Design Methodology: Design Process: Design problem, Computer aided design, Design levels, system hierarchy, **The Gate Level Design:** Four bit ripple carry adder, Four bit stream serial adder.
The Register Level Design: Data and Control, Design of a pipelined 4 bit stream serial adder, Design of a fixed point binary multiplier.
The Processor Level Design: Prototype structures, Performance measurement, Queueing models.

Unit II :
Datapath Design: n-bit ripple carry adder, n-bit twos complement adder-subtracter, carry-lookahead adder, Booths multiplication algorithm, n-bit arithmetic logic unit.
Control Design: Processor configured to implement add operation, Implementation methods, Hardwired Control: Design methods, State tables, GCD processor, Classical method, One hot method, Microprogrammed control unit, Pipeline Control: m-stage, two-stage, four-stage, Superscalar processing.

Unit III :
Memory Organization: Memory types, Performance and cost, Access modes, Memory retention, RAM organization, RAM design and examples, Optical memories, Multilevel memories, Locality of reference, Address translation, Translation look-aside buffer, Segments, Pages, Page size, **Cache Memory:** Features, Organization, Operation, Address mapping, Cache types.

Unit IV:
System Organization: Buses, Long distance communication, Computer networks, Interconnection structures, Bus control, Basic features, Bus interfacing, Timing, Bus arbitration, PCI Bus, signal of the PCI standard bus. **IO and System Control:** IO Control methods, Programmed IO, Direct Memory Access, Interrupts: Selection, Vectored interrupts, PCI Interrupts, Pipeline interrupts. **IO Processor:** Instruction types, Organization, Cache coherence. **Fault Tolerance:** Redundancy, Redundant disk arrays, Reliability.

Book:

1. *Computer Architecture and Organization , John P. Hayes, TMH*
2. *Structured Computer Organization , Andrew S. Tanenbaum, PHI.*

Master of Computer Application (M.C.A.) - Semester II
First Year M.C.A. Semester II (CBCS)
Paper IV ECCA 2T4 (Elective-II)
Operation Research

Credits : 4 **Duration: 64 Hrs**

Course Objective:

Operations research is a branch of mathematics which covers many diverse areas of minimization and optimization. The central objective of operations research is optimization, i.e. **to find out the optimum or best solution for decision making kept in mind there are limited resources.**

Course Outcomes:

On completion of the course, the students should be able to:

CO1: Understand LPP
CO2: Understand Transportation problem, assignment problem
CO3: Study of decision theory, CPM/PERT
CO4: Study of queuing Theory

Unit I:

Introduction to Operation Research (OR) - Origin and Development of OR, Nature of OR, Characteristics of OR, Classification of Problems in OR, Models in OR, Phases of OR, uses and Limitations of OR, Methodologies in OR, Applications in OR. **Linear Programming -** Concept of Linear Programming Model, Mathematical Linear Programming, Formulation of the Simplex Method.

Unit II:

Transportation Problem - Mathematical Model for Transportation Problem, Types of transportation Problem. **Assignment Problem -** Zero-One programming model for assignment Problem, Types of assignment Problem, Hungerian Method, Branch and Bound technique for Assignment Problem. **Game Theory -** Terminologies of Game Theory, Two person Zero-Sum Games, The Maximin-Minimax Principle, Games without Saddle Points Mixed Strategies, Graphical Solution of 2xn and mx2 Games, Dominance Property.

Unit III:

Decision Theory –Introduction, Decision under Certainty, Decision under Risk, Decision Under Uncertainty, Decision Tree**. Network Scheduling By CPM/PERT –** Introduction, Basic Concept, Constraints in Network, Critical Path Methods (CPM), PERT Network, PERT Calculation, Time-Cost-Trade-Off Aspects in Network Technique, Advantage of Network.

Inventory Control -Introduction, Inventory Control, Selective Control Techniques, Types of Inventory, Economic Lot Size Problem, Problem of EOQ with shortage, Inventory Control Techniques-Uncertainty Demand, Inventory Control Techniques-Stochastic Problem, Inventory Control with Price Breaks.

Unit IV:

Queuing Theory - Introduction, Terminologies of Queuing System, Characteristics of Queuing System, Poisson Process and Exponential Distribution, Classification of Queues, Definition of Transient and steady States, Poisson Queues, Non-Poisson Queuing Systems, Cost-Profit Models in Queuing, Queuing Control.

Books:

1. Operation Research , KantiSwarup, P.K.Gupta, Man Mohan Sultan .
2. Operation Research , Hira Gupta.
3. Operation Research , R. Panneerselvam [PHI].
4. Operation Research Problems & Solutions , Sharma J.K., Macmillan
5. Operation Research Theory & Application , Sharma J,K, MacMillan

Master of Computer Application (M.C.A.) - Semester II
First Year M.C.A. Semester II (CBCS)
Paper IV ECCA 2T4 (Elective-III)
Cyber Forensics

Credits : 4 **Duration: 64 Hrs**

Course Objective:

The main goal of computer forensics is to identify, collect, preserve, and analyze data in a way that preserves the integrity of the evidence collected so it can be used effectively in a legal case.**Course Outcomes:**

On completion of the course, the students should be able to:

CO1: Understand the different types of vulnerability scanning
CO2: know the different network defense tools and web application tools
CO3: understand the different types of cyber crimes and laws
CO4: understand the different tools for cyber crime investigation

Unit I :

Systems Vulnerability Scanning Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet

Unit II :

Network Defense tools Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System

Web Application Tools Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, , HTC-Hydra

Unit III :

Introduction to Cyber Crime and law Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.

Unit IV :

Introduction to Cyber Crime Investigation Firewalls and Packet Filters, password Cracking, Key loggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

Books:

1. Anti-Hacker Tool Kit (Indian Edition) , Mike Shema, Mc Graw Hill.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives , Nina Godbole and SunitBelpure, Wiley
3. The Unofficial guide to Ethical Hacking, Ankit Fadia, Laxmi Publi.

Master of Computer Application (M.C.A.) - Semester II
First Year M.C.A. Semester II (CBCS)
Paper IV ECCA 2T5
Android Programming

Credits : 4 **Duration: 64 Hrs**

Course Objective:

The main goal of Android Programming is to create hard-hitting mobile applications and learn how to integrate them with other services. Creating intuitive, reliable mobile apps using the android services and components also to create a seamless user interface that works with different mobile screens.

.**Course Outcomes:**

On completion of the course, the students should be able to:

CO1: Able to develop apps based on different types of menus
CO2: Make decision to solve a problem using package, library and threads Handling Errors and Exceptions
CO3: Ability to design and develop database applications
CO4: Able to design and develop mobile applications works with internet applications

Unit I:

Getting an Overview of Android Introducing Android , Listing the Version History of Android Platform , Discussing Android APIs , Describing the Android Architecture, Application Framework Exploring the Features of Android , Discussing about Android Applications , The Application Components The Manifest File , Downloading and Installing Android , Downloading and Installing the Android SDK Setting up Android Virtual Device , Setting up Android Physical Device , Exploring the Development Environment , The Java Perspective Using Eclipse , The DDMS Perspective , The Command-Line Tools , Developing and Executing the First Android Application, Using Eclipse IDE to Create an Application , Running Your Application , Exploring the Application, Using Command-Line Tools

Unit II:

Using Activities, Fragments, and Intents in Android

Working with Activities Creating an Activity , Starting an Activity , Managing the Lifecycle of an Activity, Applying Themes and Styles to an Activity , Displaying a Dialog in the Activity , Hiding the Title of the **Using Intents** Exploring Intent Objects, Exploring Intent Resolution, Exploring Intent Filters , Resolving Intent Filter Collision , Linking the Activities Using Intent, Obtaining Results from Intent , Passing Data Using an Intent Object , **Fragments** Fragment Implementation , Finding Fragments ,Adding, Removing, and Replacing Fragments , Finding Activity Using Fragment , Using the Intent Object to Invoke Built-in Application .

Unit III:

Working with the User Interface Using Views and View Groups

Working with View Groups, The LinearLayout Layout , The RelativeLayout Layout ., The Scroll View Layout , The TableLayout Layout ,The FrameLayoutLayout,TheTabLayout Using the Action Bar , Working with Views , Using the Text View , Using the EditText View , Using the Button View , Using the Radio Button View , Using the CheckBox View ,Using the Image Button View ,Using the Toggle Button View , Using the RatingBar View, Binding Data with the AdapterView Class , Using the ListView Class Using the Spinner, Using the Gallery View ,Designing the AutoTextCompleteView ,Implementing Screen Orientation , Anchoring the Views of the Current Activity , Customizing the Size and Position of the Views , Designing the Views Programmatically , **Handling UI Events** Handling User Interaction with Activities, Handling User Interaction with the Views , **Specialized Fragments** ListFragment, DialogFragment , PreferenceFragment , **Creating Menus** The Options Menu , The Context Menu , The SubMenus, **Handling Pictures and Menus with Views, Working with Image Views** , Displaying Images in the Gallery View , Displaying Images in the Grid View , Using the ImageSwitcher View , Designing Context Menu

for Image View , Using the AnalogClock and DigitalClock Views , Embedding Web Browser in an Activity , **Notifying the User** ,Creating the Toast Notification , Creating the Status Bar Notification , Creating the Dialog Notification

Unit IV:

Storing the Data Persistently, **Introducing the Data Storage Options** Using Preferences, **Using the Internal Storage**, Exploring the Methods Used for Internal Storage, Developing an Application to Save User Data Persistently in File, **Using the External Storage**, Exploring the Methods Used for External Storage, Developing Application to Save File in SD Card.

Using the SQLite Database, Creating the Database Helper Class, Creating the Layout and Main Activity Class, Creating the Layout and Activity for the Insert Operation, Creating the Layout and Activity to Search a Record, Creating the Activity Class to Fetch All Records, Creating the Layout and Activity for the Update Operation, Creating the Layout and Activity for the Delete Operation., Executing the Database Operations, **Working with Content Providers**, Exploring the android. provider Package, Creating User-Defined Content Provider, Consuming User-Defined Content Provider

Emailing and Networking in Android , Building an Application to Send Email **Networking in Android**, Getting an Overview of Networking Fundamentals , **Checking Network Availability**, Accessing Web Services Using HTTP Post, Accessing Web Services Using the GET Method , Working with Binary Data and Text Files, Consuming JSON Services , Sockets Programming

Book:

1. *Android Application Development (with Kitkat Support) Black Book, Pradeep Kothari, DreamTech Press*
2. *Android Wireless Application Development Volume I: Android Essentials, Third edition, Lauren Darcey, Shane Conder, Pearson.*
3. *Android, Prasanna Kumar Dixit, Vikas Professional Master-Class Series.*

Master of Computer Application (M.C.A.) - Semester III
Second Year M.C.A. Semester III (CBCS)
Paper I- ECCA 3T1
Artificial Intelligence

Credits : 4 **Duration: 64 Hrs**

Course Objective:

To impart knowledge about Artificial Intelligence and to understand the basic principles of Artificial Intelligence. Students will be able to apply major algorithms, methods in the field of artificial intelligence.

Course Outcomes:

On completion of the course, the students should be able to:
CO1: to understand the AI problems and search Techniques
CO2: to understand the concepts of knowledge representation, and predictive logic
CO3: to know the game playing using AI and planning
CO4: to understand the concepts of Natural Language processing and distributed AI

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, third edition, Elaine Rich, Kevin Knight, Shivashankar B. Nair,Mcgraw Hill Inc.*
2. *Artificial Intelligence: A Modern Approach (Paperpack). Stuart Russell and Peter Norvig. Pearson; 3rd edition.*
3. *Lisp Programming, Rajeo Sangal ,TMH*
4. *Artificial Intelligence and Expert Systems , Jankiraman, Sarukes*
5. *A first course in Artificial intelligence, Deepak Khemani, McGraw hill.*

Master of Computer Application (M.C.A.) - Semester III
Second Year M.C.A. Semester III (CBCS)
Paper II- ECCA 3T2
Big Data Analytics

Crdits : 4 **Duration: 64 Hrs**

Course Objective:

This course gives an overview of Big Data, It focuses on storage, retrieval and processing of big data and on the various tools/algorithms that are available for storage, processing of Big Data. The main objective of this course is to make students comfortable with various tools and techniques required in handling enormous amounts of data. It also helps a student to perform a variety of "analytics" on different data sets and to arrive at positive conclusions.

Course Outcomes:

On completion of the course, the students should be able to:

CO1: to learn the history of big data and various technologies for handling big data

CO2: to understand the big data foundation, virtuliazation approaches and storing data in database and data warehouse.

CO3: to learn the various features of R language for big data processing.

CO4: to understand the data visualization, social media analytics and mobile 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, Cloud computing and big data, In-memory computing Technology for Big-Data.

Understanding Hadoop Ecosystem: Hadoop Ecosystem, Hadoop Distributed file system, 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*

Master of Computer Application (M.C.A.) - Semester III
First Year M.C.A. Semester III (CBCS)
Paper III- ECCA 3T3
Machine Learning

Credits : 4 **Duration: 64 Hrs**

Course Objective:

The objective of Machine Learning course is to make the student to be able to formulate machine learning problems corresponding to different applications. The student will understand a range of machine learning algorithms along with their strengths and weaknesses and will be able to apply machine learning algorithms to solve problems using machine learning algotithms.

Course Outcomes:

On completion of the course, the students should be able to:

CO1: to understand the concepts and types of machine learning.
CO2: to understand the perceptron, back propagation and curse of dimensionality
CO3: to know the construction of decision tree and various algorithms for machine learning.
CO4: to understand the dimensionality reduction and graphical model in machine learning

Unit 1 :

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 Back Propagation – 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. *Machine Learning, An Algorithmic Perspective,Second Edition.,Stephen Marsland,CRC Press (Taylor & Francis Group) Chapman & Hall Book*
2. *Introduction to Machine Learning (Adaptive Computation and Machine Learning Series), Ethem Alpaydin,Third Edition, MIT Press*
3. *Machine learning – Hands on for Developers and Technical Professionals, Jason Bell, Wiley*
4. *Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, Peter Flach, Cambridge University Press.*
5. *Deep Learning , Rajiv Chopra, Khanna Publi*
6. *Machine Learning, V. K. Jain, Khanna Publi.*

Master of Computer Application (M.C.A.) - Semester III
Second Year M.C.A. Semester III (CBCS)
Paper IV- ECCA 3T4 (CE2-1)
Mobile Computing

Credits : 4 **Duration: 64 Hrs**

Course Objective:
The aim of this course is to develop an understanding of the ways that mobile technologies can be used in various fields and to understand the fundamentals and various computational processing of mobile networks.

Course Outcomes:
On completion of the course, the students should be able to:
CO1: To understand concepts of Mobile Communication
CO2: to learn wireless and CDMA based communication
CO3: to understand the databases, server computing and synchronization of languages for mobile computing.
CO4: to know the mobile devices server management, mobile agents and mobile application languages

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- 2000, i-mode, OFDM, 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.*

Master of Computer Application (M.C.A.) - Semester III
Second Year M.C.A. Semester III (CBCS)
Paper IV- ECCA 3T4 (CE2-2)
Soft Computing

Credits : 4 **Duration: 64 Hrs**

Course Objective:

The main aim of this course is to uncover the students to soft computing, various types of soft computing techniques, and applications of soft computing.

Course Outcomes:

On completion of the course, the students should be able to:

CO1: to understand the soft computing versus hard computing ,techniques and algorithms.

CO2: to learn about neuron, neural network and applications of neural network

CO3: to know the Unsupervised learning in Neural Network, support vector machine and self-organization map

CO4: to understand fuzzy systems and fuzzy logic theory.

Unit I :

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

Master of Computer Application (M.C.A.) - Semester III
Second Year M.C.A. Semester III (CBCS)
Paper IV - ECCA 3T4 (CE2-3)
Data Mining

Credits : 4 **Duration: 64 Hrs**

Course Objective:

The objective of this course is to grasp the data mining concepts and techniques for discovering interesting patterns from data in numerous applications. It also highlights techniques for developing effective, efficient, and scalable data mining tools.

Course Outcomes:

On completion of the course, the students should be able to:

CO1: to understand the data , data preprocessing and data mining concepts.
CO2: to learn visualization techniques, classification decision trees and model evaluation.
CO3: to know various classifiers, association analysis and algorithms.
CO4: to understand cluster analysis and anomaly detection

.

Unit I:

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

Master of Computer Application (M.C.A.) - Semester III
Second Year M.C.A. Semester III (CBCS)
Paper V- ECCA 3T5
Programming in Python

Credits : 4 **Duration: 64 Hrs**

Course Objective:
The course is designed to provide knowledge of Python also to acquire programming skills , object-oriented skill in Python. This course will help the students to develop a web based applications using python.

Course Outcomes:
On completion of the course, the students should be able to:

CO1: to understand the fundamentals of Python programming
CO2: to learn and apply the concepts of functions, modules and interfacing to the operating system
CO3: to apply the concepts of file handling, network communication and multimedia.
CO4: to apply the concepts of python for web development, learn different web tools and architecture of python

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 Envionrtment,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.

Bridge course :

	Bridge course	Hours
Unit I	**Programming in C language**	**10**
Unit II	**Basic Mathematics and Statistics**	**8**
Unit III	**Digital Electronics**	**8**
Unit IV	**Operating System Concepts**	**5**

Unit I :Programming in C language

- Algorithm and Flowcharts
- C Character set, Tokens, Identifier, Keywords, Variables, Data types, Qualifiers., Operators and Expressions , Library functions. : Maths, string handling Functions., Control Structure: Compound Statement, Selection Statement, Iteration statement Arrays: Need, Types: Single and Two Dimensional, Functions, pointers.

Unit II: Basic Mathematics and Statistics

- Mathematical Logic :Connectives, Negation, conjunction, Disjunction, statement formulas and truth tables, conditional and Bi-conditional, well formed formulas, Tautologies, Equivalence of formulas, duality law, Tautologies implications.
- Set Theory : Set, Subsets operations on set, Venn diagram, algebra on sets, Cartesian product of sets, Binary relations, Properties of binary relation, Relation matrix and the graph of relation.
- Measures of Central Tendency - Frequency Distribution, Continuous Frequency Distribution, Graphic Representation of a Frequency Distribution Average or Measures of Central Tendency or Measures of Locations, Requisites for an ideal Measure of Central Tendency Arithmetic: Mean Median, Mode, Geometric Mean and Harmonic Mean, Weighted Average, Relationship amongst different Averages.

Unit III: Digital Electronics

- Number System: Binary, Octal, Decimal and Hexadecimal number system and their inter-conversion. Binary Codes: BCD, Excess 3, Parity, Gray, ASCII and EBCDIC codes, their advantages and disadvantages.
- Logic gates: Truth table, properties and symbolic representation of NOT, AND, OR, NOR, NAND, EX-OR, EX-NOR gates. NOR and NAND gates as a universal gates. Laws and identities of Boolean algebra, DeMorgan's theorem, Use of Boolean algebra for simplification of logic expression, Karnaugh map for 2,3,4 variable, Simplification of SOP and POS logic expression using K-map.

Unit IV: Operating System Concepts

- Structure of Operating System, Operating System functions, Characteristics of Modern OS. Process Management: Process states, Creation, Termination, Operations on Process, Concurrent process, Processes Threads, Multithreading, Micro Kernels. CPU Scheduling: Schedulers, Scheduling Methodology, CPU Scheduling Algorithm: FCFS, SJF, RR, Priority Scheduling.

Books :

1. *Programming in C by E. Balagurusamy TMH Publications.*
2. *Discrete Mathematical Structures with applications to computer Science By J,P.Tremblay & R. Manohar, (TMH)*
3. *Discrete Mathematical Structures by Kolman Busby and Ross (pearson)*
4. *Fundamental of Mathematical Statistics by Gupta and Kapoor*
5. *Digital Electronics by Gothman(PHI)*
6. *Digital and analogue technique by Navaneeth, Kale and Gokhale*
7. *Operating Systems by P. Balakrishna Prasad [Scitech Publication]*

Note : .Bridge course is compulsory for all the students who got the admission in MCA course under criteria that candidate Passed B.Sc./ B.Com./ B.A. with Mathematics at l0+2 Level or at Graduation Level. Bridge Course will be conducted by the department at the beginning of session for MCA I students in semester I. Only grade point will be given to this course. Examination to this course will be conducted by the department and grade point will be given upon their performance.

1. Project Work

Every student is required to carry out a full time internship in semester IV and submit the project work done during internship.

2. Seminar

In MCA semester IV, the student will have to deliver a seminar on any topic relevant to the syllabus / subject encompassing the recent trends and development in Computer Science/ application. The topic of the seminar will be decided at the beginning of the semester in consultation with the supervising teachers. The student has to deliver the seminar which will be followed by discussion. The seminar will be open to all the teachers of the department, invitees, and students. The students should submit the seminar report typed and properly bound in two copies to the head of the department. The said shall be evaluated by the concerned supervisor / head of the department. The record of the seminar should be preserved till the declaration of the final result.