

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 and II

(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

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, built-in and user- defined exception.

Multithreading : Life Cycle, Thread class and Runnable Interface, isAlive(), join(), Priorities, 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, JDK, JAR files, Introspection, Developing Beans using JDK.

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

Credits : 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-Hellman, 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 Tanenbaum ,PHI

2. *Network Security and Essentials: Application and standards* ,William Stallings, Pearson

3. *Cryptography and network security* , William Stallings , 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, Templating 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. *PHP5.1 for 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, serializability, 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

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 IIS. IIS Manager - Creating a virtual Directory, 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. **Caching and Performance tuning** - Designing for 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. Rittinghouse, 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-subtractor, 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, Hungarian 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 $2 \times n$ and $m \times 2$ 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 Worms, 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 AutoTextView ,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.