List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Computer Science and Information Technology*

Programme Name : *MCA*

Academic Year : 2019-20

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
	MCA-202	Object Oriented Programming with C++
	MCA-204(Elective-I(1))	Computer Networks
	MCA-205(Elective-2(1))	Object Oriented SoftwareEngineering
	MCA-205(Elective-2(2))	Multimedia
	MCA-205(Elective-2(2))	Linux Operating Systemand Shell Programming
	MCA-206	OOPS LAB
	MCA-207	LAB2
	MCA-302	Artificial Intelligence
	MCA-303	Relational Database Management System
	MCA-304(Elective-III(1))	Programming with java
	MCA-305(Elective-IV(1))	Web Technology
	MCA-305(Elective-IV(2))	Pattern Recognition
	MCA-305(Elective-IV(3))	V.B.Net Programming
	MCA-306	RDBMS LAB
	MCA-307	LAB-2
	MCA-405(Elective-V(1))	Mobile Application Programming
	MCA-405(Elective-V(2))	C# and .net Framework
	MCA-405(Elective-V(3))	Cloud Computing
	MCA-406	LAB

	MCA-407	Minor Project
	MCA-501	Soft Computing
	MCA-502	Computer Graphics & Multimedia
	MCA-503	Data Mining & Data Warehousing
	MCA-504(Elective-VII(1))	Big Data Analytics
	MCA-505 (Elective-VIII(2))	Network Security
	MCA-505 (Elective-VIII(3))	Image processing
	MCA-601	Major Project

HEAD
DEPT OF CSIT
G.G.V. BILASPUR (C.G.)

Department of Computer Science & Information Technology Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

SYLLABUS FOR MCA COURSE UNDER CHOICE BASED CREDIT SYSTEM (CBCS) *

Session 2017-2018 (On and after)

MCA

Note: The decision of the GG Vishwavidyalaya for implementing CBCS system on this course shall be final, rest will remain the same.

Semester 1

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-101	Introduction to Information Technology	4		40	60	4
2	MCA-102	Computer programming & Numerical Methods	4		40	60	4
3	MCA-103	Discrete Mathematical Structures	4		40	60	4
4	MCA-104	Data Structures using C	4		40	60	4
5	MCA-105	Computer Organization	4		40	60	4
6	MCA-106	LAB: Data Structure using C		1		100	1
7	MCA-107	LAB-II: Computer Hardware and Digital Electronics		1		100	1
		Total	20	02	200	500	22

Semester 2

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-201	Principles of Operating System	4		40	60	4
2	MCA-202	Object Oriented Programming with C++	4		40	60	4
3	MCA-203	Theory of Computation	4		40	60	4
4	MCA-204	Elective I	4		40	60	4
5	MCA-205	Elective II	4		40	60	4
6	MCA-206	OOP Lab (C++)		1		100	1
7	MCA-207	LAB based on Elective- II		1		100	1
		Total	20	02	200	500	22

Semester 3

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-301	Probability and Statistics	4		40	60	4
2	MCA-302	Artificial Intelligence	4		40	60	4
3	MCA-303	Relational Data Base Management System	4		40	60	4
4	MCA-304	Elective III	4		40	60	4
5	MCA-305	Elective IV	4		40	60	4
6	MCA-306	RDBMS LAB		1		100	1
7	MCA-307	LAB based on Elective –III / IV		1		100	1
		Total	20	02	200	500	22

Semester 4

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-401	Design and Analysis of Algorithm	4		40	60	4
2	MCA-402	Compiler Design	4		40	60	4
3	MCA-403	Optimization Techniques	4		40	60	4
4	MCA-404	Elective V	4		40	60	4
5	MCA-405	Elective VI	4		40	60	4
6	MCA-406	Computer Network LAB		1		100	1
7	MCA-407	Minor Project		1		100	1
		Total	20	02	200	500	22

Semester 5

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-501	Soft Computing	4		40	60	4
2	MCA-502	Computer Graphics and Multimedia	4		40	60	4
3	MCA-503	Data Mining and Data Warehousing	4		40	60	4
4	MCA-504	Elective VII	4		40	60	4
5	MCA-505	Elective VIII	4		40	60	4

6	MCA-506	Lab based on MATLAB		1		100	1
7	MCA-507	Minor Project		1		100	1
		Total	20	02	200	500	22

Semester 6

Sno	Subject Code	Title	Credit		Marks		Credits
			L	P	Internal	External	
1	MCA-601	Major Project	-	-	-	500	15
		Total	-	-	-	-	15

Total Course Credits – 125
Note: Electives to be decided at the start of the respective semester

*** The syllabus is subjected to change as per the requirement.**

Electives

Sl.No	Paper Code	(I)	(2)	(3)
1	MCA-204 (Elective-I)	Computer Networks	System Analysis and Design	Introduction to Micro Processor
2	MCA-205 (Elective-II)	Object Oriented Software Engineering	Multimedia	Linux Operating System and Shell Programming
3	MCA-304 (Elective-III)	Advanced JAVA Programming	System Software	Neural Network
4	MCA-305 (Elective-IV)	Web Technology	Pattern Recognition	V.B.Net Programming
5	MCA-404 (Elective-V)	E-Commerce	Financial Accounting	Software Testing
6	MCA-405 (Elective-VI)	Mobile Application Programming	C# and .net Framework	Cloud Computing
7	MCA-504 (Elective-VII)	Big Data Analytics	Advanced Operating System	Parallel Processing
8	MCA-505 (Elective-VIII)	Management Information System	Network Security	Image Processing

MCA-202

Object Oriented Programming with C++

1. **Principles of OOP:** Procedure oriented Vs Object oriented, OOP paradigm, Features of OOP ,Basic Data types Tokens, Keywords, Constant ,Variables, Operator I/O statements , Structure of C++ program, Arrays, pointers, Object modeling technique (OMT).

2. **Function, Object and Class:** Defining class, Abstract class ,Function prototype, Function with parameter ,Passing object as a parameter, Constructor function ,Types of constructor, Destructor Friend function , Friend class, Dynamic allocation operator new and delete.

3. **Polymorphism and Inheritance:** Types of polymorphism, Constructor overloading ,Operator overloading, Template function Template class, Types of inheritance ,Private ,protected and public derivation of class ,Resolving ambiguity Pointer to object, This pointer ,Virtual class , virtual function.

4. **Input - output and File handling:** I/O classes ,File and stream classes ,Opening and closing file Detecting end of file, String I/O**,** Char I/O, Object I/O, I/O with multiple object ,File pointer, Disk I/O**.**

5. **Exception handling, Name spaces and Standard Template library (STL):** Need of Exception handling ,try ,catch and throws keywords , defining namespace ,benefit of namespace, Component of STL.

Readings:

1. Object oriented programming with C++ by E.Balagurusamy II nd edition Tata Mc-Graw Hill.
2. Object Oriented Programmin By McGregor and Sykes S A, 1992 Van Nostrand.
3. The C++ Programming Language By Strustrp B,Addision Wasley.
4. Object Oriented Programming in C++ By Lafore R, Galgotia Publications.
5. Introduction to Object Oriented Programming By Witt KV, Galgotia Publications.
6. Object Oriented Programming By Blaschek G, Springer Verlag

MCA-204 ELECTIVE-I (1)

Computer Networks

1. **Introduction and Physical Layer :Introduction:** Goal and application Network Hardware and Software, Protocol Hierarchies, Design Issue of the layers, Interfaces and services, Connection oriented and connection less services, Service Primitives, Reference Models – The OSI Reference model, The TCP/IP Model ,Types of computer Network :LAN,MAN,WAN, Topologies, Transmission mode .

   Physical Layer :Data and signal, Analog and digital Communication, Transmission Media ,Concept of data transmission, Switching Techniques ,Communication Satellites – Geosynchronous Satellite – VSAT, Low Orbit Satellites, ISDN and ATM.

2. **Data Link Layer :** Data Link Layer design issues Data link control:Framing, Flow control. Error Detection and Correction. DLC protocol :Stop and Wait Protocol, Sliding window protocol, A Simplex protocol for noisy channel, Medium access sublayer: Channel allocation :static and dynamic ,Multiple access protocol FDDI, Data Link Layer in the Internet : SLIP,PPP. Wired and Wireless LAN protocol.

3. **Network Layer :** The Network Layer Design Issue, IP addressing, Address mapping, Error reporting ,Multicasting ,Delivery, Forwarding and Routing. The Network Layer in the Internet : The IP Protocol. subnets, Internet control protocols ,internet multicasting.

4. **Transport Layer :**The Transport layer services, The concept of client and server in terms of socket addressing Quality of service, Transport service primitives and buffering, Multiplexing, Crash Recovery. The Internet Transport Protocols (TCP/IP) – The TCP Service Model, The TCP protocol, The TCP segment header, TCP connection management, TCP transmission policy, TCP congestion control, TCP timer management, UDP.

5. **Presentation and Application Layer :** Network Security, Traditional Cryptography, Private key cryptography and public key cryptography, Authentication protocols, DNS ,SNMP,E-mail, application layer protocols.

Readings:

1. Data Communications and Networking By Forouzan, Tata McGraw Hill Company.
2. Computer Networks By A.S. Tanenbaum
3. Computer Network By S.S.Shinde ,New Age International Publisher.
4. Data and computer Communication by Shashi banzal ,Firewall media
5. Internetworking with TCP/IP :Principles,protocols,and Architecture Vol 1 5th Edition ,PHI publication
6. Data Communications and Computer Network by Prakash C Gupta, PHI Publication.

MCA-205 ELECTIVE-II (1)

Object Oriented Software Engineering

1. **Software Engineering Paradigms:** Software Development process models. **Project & Process**: Project management, Process & Project metrics. **Fundamental concepts of object oriented programming:** Introduction to the principles of object-oriented programming (classes, objects, messages, encapsulation, inheritance, polymorphism, exception handling, and object-oriented containers). **Object Oriented Analysis:** Object Oriented Analysis, **Analysis Techniques:** Object Modeling, Dynamic Modeling, and Functional Modeling. Adding Operations, Analysis Iteration.

2. **Using UML**: UML Introduction. **Object Modeling Notations**: Basic Concepts. **Structural Diagram:** Class Diagram, Object Diagram, Component Diagram, Deployment Diagram. **Behavioral Diagrams:** Use Case Diagram, Interaction Diagram, Activity Diagram, Statechart Diagram. **Modeling with Objects. System Design, Object Design.**

3. **Object Modeling**: Objectives. **Advanced Modeling Concepts:** Aggregation, Abstract Class, Multiple Inheritance, Generalization and Specialisation, Meta Data and Keys, Integrity Constraints, **Dynamic Model:** Objectives, Events, State and State Diagram, Elements of a State Diagram, Advanced Concepts in Dynamic Modeling, **Functional modeling.**

4. **Patterns:** Benefits of patterns, using patterns during Analysis, using Pattern during Design.

5. **Object mapping with Database:** Objectives, Relational Database Schema for Object Modes, Object Classes to Database Tables, Mapping Associations to Tables, Mapping Generalizations to Tables, Interfacing to Databases.

Readings:

1. Bernd Bruegge & Allen H. Dutoit, “Object-Oriented Software Engineering”, 2009.
2. Bertrand Meyer, Object Oriented Software Construction, Prentice-Hall.
3. Grady Booch, James Rumbaugh and Ivar Jacobson, Unified Modeling Language Guide, Addison-Wesley.
4. Ivar Jacobson, “Object-Oriented Software Engineering”, Pearson Education, 2009.
5. Stephen R. Schach, “Object-Oriented Classical Software Engineering”, Mc Graw Hill, 2010.
6. Yogesh Singh, “Object-Oriented Software Engineering”, 2012
7. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005

MCA-205 ELECTIVE-II (2)

Multimedia

1. Introduction to Multimedia System Multimedia elements, Multimedia applications, Global structure, Technologies for Multimedia system. Multimedia: Media & Data Streams Multimedia: media & data streams, Properties, Traditional data stream characteristics, Data stream characteristics for continuous media, Information units.

2. Sound / Audio Sound Concepts, Music: MDI Concepts, MIDI devices, MIDI messages, MIDI software, Speech: Speech generation, Speech Analysis, Speech Transmission. Image And Graphics Digital Image Representation, Image Formats, Graphics Formats, Image Processing: Image Synthesis, Image Analysis, Image Transmission.

3. Video & Animation Basic concepts, Television (Conventional systems, Enhanced definition systems, High Definition system), Computer based Animation.

4. Data Compression Storage space, Coding requirements, Source Entropy & Hybrid coding, Basic compression techniques, Introduction to following compression techniques: JPEG, H.261 (PX64), MPEG ,DVI

5. Optical Storage Media & Retrieval Technologies Basic Technology, Video Disk & other WORMS, CD ROM, CD ROM Extended Architecture, Compact Disk Magneto optical.

Readings:

1. Multimedia System Design By P. K. Andleigh, Kiran Thakrar.

2. Multimedia Computing Communication & Application. By Ralf Steinmetz, & Klaranashtedt. (Pearson Education).

MCA-205 ELECTIVE-II (3)

Linux operating System and Shell Programming

1. **INTRODUCTION TO LINUX:** History, The Linux Architecture, Features of Linux, Internal and External Commands, Command Structure, difference between Linux and Unix, various Linux distributions, basic commands.**UTILITIES:** file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, Text processing utilities and backup utilities, Security commands. The vi editor, security by file Permissions.

2. **INTRODUCTION TO SHELLS:** Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell Edition Environment Customization. Filters. **GREP:** Operation, grep Family, Searching for File Content. **SED:** Scripts, Operation, Addresses, commands, Applications. **AWK:** Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications.

3. **INTERACTIVE KORN SHELL:** Korn Shell Features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process. **KORN SHELL PROGRAMMING:** Basic Script concepts, Expressions, Decisions Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

4. **INTERACTIVE C SHELL:** C shell features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, On-Off Variables, Startup and Shutdown Scripts, Command History, Command Execution Scripts. **C SHELL PROGRAMMING:** Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

5. **FILE MANAGEMENT:** File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

Readings:

1. Sumitabha Das, "Unix Concepts and Applications", 4thEdition. TMH, 2006. (1, 2 units)
2. Behrouz A. Forouzan, Richard F. Gilbery, "Unix and shell Programming", 1stEdition, Cengage Learning India, 2003.
3. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones,Wrox, Wiley India Edition.

Artificial Intelligence

1. **Introduction:** Definitions and approaches, Foundation of A.I. , Challenges in AI, Area and Applications of A.I., Intelligent Agents: meaning, types, environments, examples.

2. **Problem Solving:** Problem solving as state space search, production system, writing production system and solution for a Water jug problem; some AI classical problems (statements only) cannibal missionaries, tower of Hanoi, tic tac toe, 8-puzzle, Search techniques: Breadth First, and Depth-first, Best-First Search, Hill-climbing, Heuristics, A* algorithm, local and global maxima(minima),

3. **Knowledge Representation and Reasoning**: Predicate and prepositional logic, conversion of sentences to wffs of predicate logic, Resolution, clause form, Skolem functions, Unification, Resolution in Propositional and predicate logic, Semantic Nets.

4. **Pattern Recognition:** Meaning of pattern, Pattern Recognition, Classification, Supervised & Unsupervised Learning of classifiers, K-NN, K-MEANS algorithms.

5. **Expert Systems:** Introduction, Advantages, components and participants in an expert system, Application

Readings:

1. Artificial Intelligence: E. Rich and K. Knight, Tata McGraw Hill.
2. Artificial Intelligence: A New Synthesis By Nilsson, Morgan Kaufmann.
3. Pattern Classification 2nd Edition By R.O. Duda, Hart, Stork (2001) ,John wiley, New York.
4. Pattern Recognition : Technique and Applications By Shinghal (2006) ,Oxford University Press,NewDelhi.

MCA - 303

Relational Data Base Management System

1. **Overview of Database Management** :Data, Information and knowledge, Increasing use of data as a corporate resource, data processing verses data management, file oriented approach verses database oriented approach to data management; data independence, database administration roles, DBMS architecture, different kinds of DBMS users, importance of data dictionary, contents of data dictionary, types of database languages. Data models: network, hierarchical, relational. Introduction to distributed databases.

2. **Relational Model :** Entity - Relationship model as a tool for conceptual design-entities attributes and relationships. ER diagrams; Concept of keys: candidate key, primary key, alternate key, foreign key; Strong and weak entities, Case studies of ER modeling Generalization; specialization and aggregation. Converting an ER model into relational Schema. Extended ER features.

3. **Structured Query Language :**Relational Algebra: select, project, cross product different types of joins (inner join, outer joins, self join); set operations, Tuple relational calculus, Domain relational calculus, Simple and complex queries using relational algebra, stand alone and embedded query languages, Introduction to SQL constructs (SELECT…FROM, WHERE… GROUP BY… HAVING… ORDERBY….), INSERT, DELETE, UPDATE, VIEW definition and use, Temporary tables, Nested queries, and correlated nested queries, Integrity constraints: Not null, unique, check, primary key, foreign key, references, Triggers. Embedded SQL and Application Programming Interfaces.

4. **Relational Database Design :**Normalization concept in logical model; Pitfalls in database design, update anomalies: Functional dependencies, Join dependencies, Normal forms (1NF, 2NF, 3NF). Boyce Codd Normal form, Decomposition, Multi-Valued Dependencies, 4NF, 5NF. Issues in physical design; Concepts of indexes, File organization for relational tables, De-normalization.

5. **Introduction to Query Processing and Protecting the Database & Data Organizations :** Parsing, translation, optimization, evaluation and overview of Query Processing. Protecting the Data Base - Integrity, Security and Recovery. Domain Constraints, Referential Integrity, Assertion, Triggers, Security & Authorization in SQL.

Readings:

1. Database system concept By H. Korth and A. Silberschatz, TMH.
2. Data Base Management System By Alexies & Mathews , Vikas publication.
3. Data Base Management System By C. J. Date ,Narosha Pub.
4. Data Base Management System By James Matin .
5. Principles of Database System By Ullman.
6. An Introduction to database systems By Bipin Desai, 2011 ed.,Galgotia Publication.
7. Database Management System By A. K. Majumdar & P.Bhattacharya, TMH

MCA-304 ELECTIVE-III (1)

Advanced Java Programming

1. **Basics of Core JAVA:** class, interface, exception handling.**Collections :** Collection Interfaces, Concrete Collections, The Collections Framework **Multithreading :** Creating thread and running it, Multiple Thread acting on single object,Synchronization, Thread communication, Thread group, Thread priorities, Daemon Thread, Life Cycle of Thread.

2. **Networking:**Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagrams.**Java Database Connectivity (JDBC):** Merging Data from Multiple Tables: Joining, Manipulating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.

3. **Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, HandlingHTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with HttpSession

4. **Java Server Pages (JSP):** Introduction, JavaServer Pages Overview, A First JavaServer Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries, **Enterprise Java Bean:** Preparing a Class to be a JavaBean, Creating a JavaBean, JavaBean Properties,Types of beans, Stateful Session bean, Stateless Session bean, Entity bean

5. **Remote Method Invocation:** Defining the Remote Interface, Implementing the Remote Interface, Compiling and Executing the Server and the Client, **Struts:** Basics of Struts,Struts : What and Why? ,Model1 vs Model2 ,Struts2 Features, Steps to create Struts application ,Understanding Action class ,Understanding struts.xml file

Readings:

1. "Advanced Java 2 Platform HOW TO PROGRAM" by H. M.Deitel, P. J. Deitel, S. E. Santry – PrenticeHall
2. "Beginning Java™ EE 6 Platform with GlassFish 3 From Novice to Professional" by Antonio Goncalves – Apress publication

MCA-305 **ELECTIVE-IV** **(1)**

Web Technology

1 **Internet Concept**: Fundamental of Web ,History of Web, Web development overview, Domain Name System (DNS),DHCP,and SMTP and other servers ,Internet service provider (ISP), Concept of IP Address, Internet Protocol, TCP/IP Architecture ,Web Browser and Web Server.

2. **HTML and DHTML:-** HTML Tag, Rules of HTML, Text Formatting and Style, List, Adding Graphics to Html Document, Tables and Layout , Linking Documents, Frame, Forms, Project in HTML, Introduction to DHTML, CSS, Class and DIV, External Style Sheet.

3. **Scripting Languages:** Java Script (JS) in Web Page, Advantage of Java Script, JS object model and hierarchy ,Handling event, Operators and syntax of JS, JS Function, Client side JS Vs Server side JS ,JS security, Introduction to VB Script, Operator and Syntax of VB Script, Dialog Boxes, Control and Loop, Function in VBS.

4. **XML:**Introduction to XML, XML in Action, Commercial Benefits of XML, Gaining Competitive advantage with XML, Programming in XML, XML Schema ,XSLT ,DOM structure model ,XML quires and transformation.

5. **Active Server Page (ASP):** Introduction ,Internet Information System (IIS),ASP object ,Server object, File system object, session ,Accessing data base with an ASP page ,ODBC – ADO connection object, common methods and properties, ADO record set object .Introduction to ASP.Net.

Readings:

1. The complete Reference By Thomos A. Powell ,TMH publication
2. Web Technology :A Developers Perspective ,N.P.Gopalan ,J.Akilandeswani,PHI Publication.
3. Java Script :The definite Guide By Flangam , O"Reilly
4. Java Script :Developers Resource by Kamran Husain and Jason Levitt PTR-PHI publication.
5."Mastering VB Script" BPB Publication.
6. World Wide Web design with HTML by Xavier Tata McGraw Hill Publication .
7. XML By Example, Sean Mc Grath Pentice Hall Publication.
8. Web Technology : A Developments Perspective , N.P. Gopalan, J. Akilandeswari, PHI Publication

MCA -305 ELECTIVE IV (2)

Pattern Recognition

1. **Pattern Concept:** Meaning of pattern, examples of patterns, importance of study of patterns in machine learning, meaning of labels, attributes, features, dimensions in patters with examples, pattern recognitionand classification, meaning of machine learning

2. **Pattern Recognition and classification:** Meaning and importance in machine learning, supervised and unsupervised learning with meaning and examples, classifiers, k-nn classification and k-means clustering, implementation and applications

3. **Decision Trees:** Meaning of tree and hence decision tree, building a decision tree, decision tree induction, classification using a decision tree, classification using ID3

4. **Evolutionary Computing:** Meaning of evolutionary computing, various operators used in evolutionary computing, genetic algorithms and their applications, Particle Swarm Optimization and their applications, Multi-objective Genetic Algorithms with examples

5. **Ensemble of classifiers:** Meaning and importance of ensembles, boosting and AdaBoost algorithm, bagging and random forest, weak and strong learning, ensembles of classifiers with voting

Readings:

1. Pattern Classification: Duda, R.O, Peter Hart, David Stork, 2010, Wiley India
2. Data Mining: Concept and Techniques, Morgan and Kaufmann, 2001
3. Pattern Recognition: Rajjan Shinghal, Oxford University Press New Delhi, 2006
4. Ensemble Methods, Foundations and Algorithms, Zhi-Hua Zhou, A CRC Press, Chapman and HallBook, 2010
5. Pattern Recognition, Robi Polikar, Wiley Encyclopedia of Biomedical Engineering, 2006 John Wiley & Sons, Inc

MCA-305 ELECTIVE-IV (3)

VB.NET Programming

1. **.Net framework and VB.Net:** Evolution of the .NET Framework – Overview of the .Net Framework – VB.NET – Simple VB.Net Program. VARIABLES, CONSTANTS AND EXPRESSIONS: Value Types and Reference Types – Variable Declarations and Initializations – Value Data Types – Reference Data Types – Boxing and Unboxing – Arithmetic Operators – Textbox Control – Label Control – Button Control.

2. **Control Statements:** If Statements – Radio Button Control – Check Box Control – Group Box Control – Listbox Control – Checked List Box Control – Combo box Control – Select Case Statement – While Statement – Do Statement – For Statement. METHODS AND ARRAYS: Types of Methods – One Dimensional Array – Multi Dimensional Arrays – Jagged Arrays. CLASSES: Definition And Usage of a Class – Constructor Overloading – Copy Constructor – Instance and Shared Class Members – Shared Constructors.

3. **Inheritance and Polymorphism**: Virtual Methods – Abstract Class and Abstract Methods – Sealed Classes. INTERFACES, NAMESPACES AND COMPONENTS: Definition of Interfaces – Multiple Implementations of Interfaces – Interface Inheritance – Namespaces – Components – Access Modifiers. DELEGATES, EVENTS AND ATTRIBUTES: Delegates – Events – Attributes – Reflection.

4. **Exception Handling**: Default Exception Handling Mechanism – User Defined Exception Handling Mechanism – Throw Statement – Custom Exception. MULTITHREADING: Usage Of Threads – Thread Class – Start(), Abort(), Join(), and Sleep() Methods – Suspend() And Resume()Methods – Thread Priority – Synchronization. I/O STREAMS: Binary Data Files – Text Files - Data Files – FileInfo and DirectoryInfo Classes.

5. **Additional Controls**: Timer – ProgressBar – LinkLabel – Panel – TreeView – Splitter – Menu – SDI & MDI – Dialog Boxes – Toolbar – StatusBar. DATABASE CONNECTIVITY: Advantages Of ADO.NET – Managed Data Providers – Developing a Simple ADO.NET Based Application – Creation of Data Table – Retrieving Data From Tables – Table Updating – Disconnected Data Access Through Dataset Objects.

Readings:

1. Muthu C. (2008), ”Visual Basic.NET”, 2nd Ed., Vijay Nicole Imprints Pvt.Ltd.,.
2. Jeffrey R.Shaprio (2002), “Visual Basic .NET The Complete Reference”, Mac Graw Hill
3. Michael Halvorson (2010), “Visual Basic 2010 Step by Step”, Microsoft Press.
4. Harold Davis (2002), “Visual Basic.NET Programming”, Sybex.

MCA-405 ELECTIVE-VI (1)

Mobile Application Programming

1. **Introduction of Mobile Application:** Fundamentals of mobile applications, mobile Application environment and mobile operating Systems, IDEs and various Tools.

2. **Introduction of Mobility and Building blocks of Mobile Application.**: Mobile Application development Activity life cycle, Mobile Landscape, Mobile Platforms, overview of various Mobile application tools.

3. **Mobile Operating Systems:** Android library and its characteristic, iOS library and its characteristic, Windows Phone 7 library and its characteristic

4. **App functionality based User interface and Mobile functions:** Application user Interface designing, User Interface Element, Menu, interaction among the activities. Threads, Asynchronous task, Service – states and life cycles, Notifications, Broadcast receivers, Telephony and SMS API, Animation API multimedia –Audio/Video playback and record, location aware etc.

5. **Mobile Application development in Android:** Android Architecture -Android Stack –Linux Kernel, Android Runtime Environment Dalvik virtual Machine, Android Emulator. Basics Application creation and deployment in Android, Introduction of mobile application database SQLite.

Readings:

1. Professional Mobile Application Development, Jeff Mcwherter, Scott Gowell, Wrox Publisher, 1st Ed. 2012
2. Sams Teach Yourself Android Application Development in 24 Hrs, Lauren Darcy and Shane Conder, 1sted.
3:-Android Programming, Bill Philips and Brain Hardy.
4:Android Recipes : A problem-Solution Approach ,Dave Smith and Jeff friesen.

MCA-405 ELCETIVE-VI (2)

C# and .NET Framework

1. **Introduction to C#** : Introducing C#, Understanding .NET, Overview of C#, Literals, Variables, Data types, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations

2. **Object oriented aspects of C#:** Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions

3. **Application Development on .NET:** Building Windows Applications, Accessing Data with ADO.NET

4. **Web Based Application Development on .NET:** Programming Web applications with Web Forms, Programming Web Services

5. **The CLR and the .NET Framework**: Assemblies, Versioning, Attributes, Reflection, Viewing Meta Data, Type Discovery, Reflecting on a type, Marshalling, Remoting, Understanding Server Object Types, Specifying a server with an Interface, Building a server, Building the Client, Using Single Call, Threads.

Readings

1. Programming in C#, E.Balagurusamy (Unit I, II)
2. Prgramming in C#, J. Liberty 2nd Edition – O"Reilly (Unit III, IV, V)

MCA-405 ELECTIVE-VI (3)

Cloud Computing

1. **Fundamental Cloud Computing-**Concepts, terminology, technologies, benefits, challenges, SLAs and business cost metrics associated with cloud computing,SaaS, IaaS, PaaS delivery models, common clouddeployment models, and cloud characteristics. Various applications of cloud computing.

2. **Cloud Architecture:** The technology architecture of cloud platforms and cloud-based solutions and services and their utilization via a set of cloud computing design patterns. hybrid cloud deployment models, compound design patterns, and solution architectures that span cloud and on-premise environments.

3. **Cloud Security & Governance**:**Cloud Security** :The cloud security mechanisms, A cloud security architecture. a set of security design patterns. **Cloud Governance :**the definition of cloud governance precepts, roles, practices, and processes, common governance challenges and pitfalls specific to cloud computing.

4. **Cloud Storage:** The cloud storage devices, structures, and technologies, cloud storage mechanisms, persistent storage, redundant storage, cloud-attached storage, cloud-remote storage, cloud storage gateways, cloud storage brokers, Direct Attached Storage (DAS), Network Attached Storage (NAS), Storage Area Network (SAN), various cloud storage-related design patterns.

5. **Cloud Virtualization& Microservices :** Core topic areas pertaining to the fundamental virtualization mechanisms and types used within contemporary cloud computing platforms are explored, along with various key performance indicators and related metrics. MicroServices of Cloud Computing.

Readings

1. Distributed Computing by Dollymore Cloud Computing (Wind) by Dr. Kumar Saurabh, 2nd Edison, Wiley India
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011 Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012

MCA-501

Soft Computing

1. **Introduction** -What is soft computing, important soft computing techniques

2. **Artificial Neural Network** :Biological neural network Vs Artificial neural network, Neuron Model and Neural Network Architectures, ANN terminologies, ANN benefits, Supervised learning network :Error back propagation network, Perceptron learning (single layer only),Unsupervised learning network :Kohonen self organizing feature maps (SOM)

3. **Fuzzy Logic-**Crisp set Vs Fuzzy set, Operations on Fuzzy sets, Fuzzy relation, Membership function, Fuzzy arithmetic and Fuzzy measures

4. **Genetic Algorithm –** Introduction, representations of GA by binary and real-valued numbers, Genetic Operators and Parameters: Selection, crossover, mutation, elitism, Genetic Algorithms inProblem Solving

5 **Swarm Intelligence:** Meaning, Particle Swarm Optimization: basics, terminology, problem solving using PSO

Readings:

1. Principles of soft computing , S.N.Shivanandan and S.N. deepa Wiley India publication ,First Indian edition ,2008.
2. A Comprehensive Foundation to Neural Networks , Simon Haykins , Prentice Hall
3. Fuzzy Sets and Fuzzy Logic: Theory and Applications , G. J. Klir, and B. Yuan, PHI learning ,2011.
4. Dr.G.Canon, Fuzzy Logic and Fuzzy Decision Making: Concepts and Applications, Galgotia Publication.
5. D. E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley, 1989.
6. Jang,Sun and Mizutani :Neuro-Fuzzy and soft computing :A computational Approach to learning and machine intelligence ,PHI learning ,2011.
7. N.K. Sinha & M. M. Gupta(Eds), Soft Computing and Intelligent Systems: Theory & Applications, Academic Press, 2000.

MCA- 502

Computer Graphics and Multimedia

1. **Fundamentals of Computer Graphics:** Concepts and applications, Random and Raster scan devices,input-output devices: CRT, LCD, laser printer. Output primitives: Line drawing algorithm: DDA and Bresenham‟s; Circle generating algorithm: Bresenham‟s Midpoint algorithms, Ellipse: midpoint ellipse drawing algorithm. Antialising techniques: super sampling, pixel weighting, area sampling, pixel phasing Area filling: boundary fill algorithm, flood fill algorithm: Scan-line Polygon Fill Algorithm.

2. **Transformation, viewing, Clipping:** 2-D Transformation: Translation, scaling, rotation, reflection,shear, matrix representation of all homogeneous coordinates, composite transformations. Two dimensional viewing: Viewing pipeline Window-to-view port transformation. Clipping operations: Line Clipping: Cohen Sutherland and Liang-barsky, Polygon Clipping: Cohen-Sutherland-Hodgeman and Weiler – Atherton Polygon clipping.

3. **3D Transformation, Visible Surface Detection and curves:** Visible Surface detection Algorithm:Object based and image based methods, depth comparison, A-Buffer, Back face removal, Scan-line method, Depth Sorting Method Area subdivision method. 3-D Transformation: translation, scaling,rotation, reflection. Three- dimensional object representations 3-D Viewing Projections – parallel and perspective projection. Curved lines and Surfaces: Spline representations, Interpolating and approximation curves, continuity conditions Bezier curves: concept and characteristics; B-Spline curves: concept and characteristics.

4. **Color Models and Basic Concept of Animation:** Introduction of multimedia: Properties and applications, types of medium, data stream characteristics, Basic File and Data format: BMP, JPEG,GIF, TIFF. Color models: RGB, YIQ, CMY, HSV. Animation: Basic concept, animation languages,computer-based animation, methods of controlling animation, display of animation, animation techniques: onion skinning, motion cycling, masking, morphing, and transmission of animation, Multimedia Authoring tools.

5. **Multimedia Systems:** Data compression: storage space, coding requirements. Source, entropy and hybrid coding some basic compression technique: runlength code, Huffman code. JPEG: Image preparation, Lossy sequential DCT –based mode, expanded Lossy DCT based mode, Lossless mode,and hierarchical mode. MPEG, Huffman Encoding, LWZ compression.

Readings:

1 Principles of interactive compo Graphics; W.M. Newman & Robert F Sproull.
2 Computer Graphics By Rogers TMH
3 Introductions to Computer Graphics AnirbanMukhopadhyay&Arup Chattopadhyay
4 Schaum's outlines -computer Graphics Mc Graw Hill International Edition.5
5 .Principles of Multimedia by Ranjan Parekh TMH
6 "Multimedia Systems Design", P. K.Andleigh& K. Thakrar, Prentice Hall Pvt. Ltd

MCA-503

Data Mining and Data Warehousing

1. **Data Mining:** Meaning, necessity, steps, Normal searching Vs. knowledge extraction

2. **Data Mining on different types of databases:** Relational, Data Warehouses, Transactional, Object oriented, Object relational, Spatial, Temporal and time series, Text and multimedia (i) Heterogeneous and legacy.

3. **Data Warehouse:** Meaning, definition, OLTP Vs. OLAP, Data cube, star, snow flake,constellations, basic concepts in writing of DMQL, Three Tier Architecture, Indexing.

4. **Data Preprocessing :** Noisy data, Inconsistent data, Data integration, Data transformation, Dimensionality reduction, Data compression.

5. **Classification, Clustering and Prediction:** Meaning, Neural network based classification, k-nearest neighbourhood (kNN) classifiers, Clustering, Types of Clustering, Partioning Method: k-means clustering, Prediction using Regression and Neural Network, Performance Measures.

Readings:

1. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishes (Elsevier, 2nd edition), 2006
2. Data Mining Methods for Knowledge Discovery, Cios, Pedrycz, Swiniarski,Kluwer Academic Publishers, London – 1998.

MCA 504 ELECTIVE –VII (1)

Big Data Analytics

1. **Understanding Big Data**: Datasets, Data Analysis, Data Analytics-Descriptive Analysis, Diagnostics Analytics, Predictive Analytics, Prescriptive Analytics, Big Data Characteristics – volume, velocity, variety, veracity, value, Different Types of Data – Structured Data, Unstructured Data, Semi-Structured Data

2. **INTRODUCTION HADOOP**: Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Datain and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

3. **HADOOP ARCHITECTURE** : Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

4. **Theory and methods for big data analytics**: Regression Modeling, Multivariate Analysis, Bayesian Modeling, Inference and Bayesian Networks, Support Vector and Kernel Methods, Analysis of Time Series: Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Decision Trees.

5. **Programming with R** : Basic Syntax, Data types, Variables, Operators, Decision Making, Loops, Functions, Vectors, lists, Matrices, Arrays, Data Frames, R Data Interfaces – CSV Files, Excel Files, Database, R charts & graphs , R statistics – Mean, Median, Mode, Linear Regression.

Readings:

1. Chris Eaton, Dirk deroos et al. , “Understanding Big data ”, McGraw Hill, 2012.
2. “Big Data Fundamentals: Concepts, Drivers & Techniques”, 1/e, 2016, Thomas Erl, Wajid Khattak, Paul Buhler, Prentice Hall.
3. “Big Data Analytics with R and Hadoop”, 1e, 2013, Vignesh Prajapati, Packt Publishing Ltd, UK.
4. “The Art of R Programming: A Tour of Statistical Software Design”,revised,2011, Norman Matloff, No Starch Press
5. . "Hadoop:The Definitive Guide," 3/e, 2012, Tom White, O'REILLY Publications.
6. "Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data" ,2012, Paul Zikopoulos, IBM, Chris Eaton, Paul Zikopoulos, The McGraw-Hill Companies.
7. "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications",2014, Bart Baesens, Wiley Publications .
8. “Mining of Massive Datasets”, 2012, Anand Rajaraman and Jeffrey David Ullman , Cambridge University Press

MCA-505 ELECTIVE-VIII (2)

Network Security

1. **Foundations of Cryptography and security:** Security trends, The OSI Security architecture Security attack, services and mechanism**,** Ciphers and secret messages, Mathematical tools for cryptography: substitution techniques, modular arithmetic, Euclid's algorithm, finite fields, polynomial arithmetic.

2. **Symmetric Cipher:** Symmetric cipher model, Design Principles of Block Ciphers, Theory of Block Cipher Design, Feistel cipher network structure, Data Encryption Standard (DES), Strength of DES Triple DES ,Modes of operation.Advance encryption Standard (AES)- Evaluation criteria of AES,AES cipher ,key distribution.

3. **Public Key cryptography and Hash function:** Prime numbers and testing for primarily, factoring large numbers, Principles of public key cryptosystem, RSA algorithm. Key management: Diffie-Helman Key exchange, Hash and Message authentication Code (MAC), Hash and MAC algorithms, Digital signature.

4. **IP and Web security protocols:**Authentication application: Kerberos, Public key infrastructure .E-mail: Pretty Good Privacy (PGP), S/MIME. IP security, Web Security: Secure Socket layer (SSL) andTransport layer security, Secure Electronic Transaction (SET).

5. **System Security**: Firewall, and Intrusion Detection system (IDS), Malicious Software.

Readings

1 . Cryptography and Network Security By William Stallings, 4th Edition Pearson Publication
2. Applied cryptography - protocols and algorithm By Buce Schneier, Springer Verlag 2003
3. Cryptography and Network Security By Atul Kahate , TMH Publication.
4. Cryptography and Network Security By Behrouz A. Forouzan, First Edition, TMH Publication.
5. Network Security:Private Communication in Public World By Charlie Kaufman,Radia Perlman and Mike Speciner ,PHI Publication.

MCA-505 ELECTIVE-VIII (3)

Digital Image Processing

1. **Digital Image Processing (DIP):** Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system. **Digital Image Fundamentals:** elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

2. **Image Transforms:** Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT. **Other transforms and their properties:** Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

3. **Image Enhancement: Spatial domain methods**: basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method. **Frequency domain methods:** basics of filtering in frequency domain, image smoothing filters (Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

4. **Image Restoration:** Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.

5. **Image Compression**: **Fundamentals of data compression**: basic compression methods: Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding.

Readings

1. Gonzalez and Woods: Digital Image Processing, Pearson Education.
2. Anil Jain: Fundamentals of Digital Image Processing, PHI Learning.
3. Annadurai: Fundamentals of Digital Image Processing, Pearson Education.
4. Sonka, Hlavac and Boyle: Digital Image Processing and Computer Vision, Cengage Learning.
5. Chanda and Majumder: Digital Image Processing and Analysis, PHI Learning.
6. Jayaraman, Esakkirajan and Veerakumar: Digital Image Processing, TMH.
7. William K. Pratt, Digital Image Processing, Wiley India.

MCA- 601

MAJOR PROJECT

HEAD
DEPT OF CSIT
G.G.V. BILASPUR (C.G.)