MAHARSHI DAYANAND UNIVERSITY, ROHTAK

Department of Computer Science & Applications

NORMS FOR ADMISSION TO REGULAR MCA 2-YEAR PROGRAMME
AS PER THE LATEST GUIDELINES OF AICTE 2020-21
With effect from the Session 2020-21

Eligibility for Admission to MCA 2-year Programme:

a) Passed BCA/B.Sc.(Hons.) Computer Science/ B.E. or B.Tech.(CSE/IT)/ B.Voc.(Software Development/IT) or an equivalent degree with having at least 50% marks (45% for SC/ST candidates of Haryana only) in aggregate.

Or

b) Passed B.Sc/ B.Com/ B.A with Mathematics at 10+2 level or at Graduation level with having at least 50% marks(45% for SC/ST candidates of Haryana only) in aggregate, along with the students admitted with this eligibility will have to simultaneously undertake additional ****Bridge Course*** as prescribed by the University during the first semester.

Note: * It is compulsory for each student to pass out Bridge Course (three additional theory papers and one practical as prescribed in scheme of examination of Bridge Course) as per University norms during the 1st year of MCA-2 year course and the degree will be awarded after the completion of Bridge Course. However, these papers under Bridge Course will be taught only in the 1st semester of the course.

SCHEME OF EXAMINATIONS AND SYLLABUS
REGULAR MASTER OF COMPUTER APPLICATIONS 2- YEAR PROGRAMME
With effect from the Session 2020-21

Scheme of Examinations and Syllabus
for
Bridge Course to Regular MCA 2- year programme
With effect from the Session 2020-21

Programme Specific Outcomes:
The students upon completion of bridge course will be able to:

PSO1: To scale up the knowledge and understanding to be able to continue MCA 2-year programme.
PSO2: Apply knowledge of computing fundamentals for understanding problems that may be solved using computers.
PSO3: Analyze scenarios that require integrated solutions using one or more Programming Languages.
PSO4: Create basic computing skills to undertake more specialized courses offering emerging technologies with ease.
PSO5: Advance their career in the domain of computer science by acquiring higher order skills.

Course Code	Course Name	External Marks	Internal Marks	Total	Credits
20BCC11C1	Computer Fundamentals and Programming in C	80	20	100	4:0:0
20BCC11C2	C++ and Data Structures	80	20	100	4:0:0
20BCC11C3	Visual Basic & Database Systems	80	20	100	4:0:0
20BCC11CL1	Lab based on 20BCC11C1, 20BCC11C2 & 20BCC11C3	80	20	100	0:0:4
Total credits					16

Note: It is compulsory for each student to pass out Bridge Course (three additional theory papers and one practical as prescribed in scheme of examination of Bridge Course) as per University norms during the 1st year of MCA-2 year course and the degree will be awarded after the completion of Bridge Course. However, these papers under Bridge Course will be taught only in the 1st semester of the course.

Scheme of Examinations and Syllabus
for
MCA 2- year programme
With effect from the Session 2020-21

Programme Specific Outcomes:

The students upon completion of Regular **MCA 2-year Programme** will be able:

PSO1 To apply knowledge of computing fundamentals, computing specialization and domain knowledge for the abstraction and conceptualization of computing models from defined problems and requirements.

PSO2 To have the ability to understand and analyze a given real-world problem and propose feasible computing solutions. Also analyze customer requirements, create high level design, implement and document robust and reliable software systems.

PSO3 To transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies.

PSO4 To use the latest technologies like IoT, AI, Machine Learning, Big Data Analytics, Cyber Security and modern hardware and software tools necessary for innovative software solutions and to possess leadership and managerial skills with best professional ethical practices and social concern

PSO5 To master fundamental project management skills, concepts and techniques, set attainable objectives and ensure positive results, meeting scope, time and budget constraints

PSO6 To recognize the need for self-motivation to engage in lifelong learning, the social, professional, cultural and ethical issues involved in the use of computer technology and give them due consideration in developing software systems

PSO7 To assess the need for innovation and initiate the process through entrepreneurship or otherwise and to work collaboratively as a member or leader in multidisciplinary teams

PSO8 To select their career after acquiring necessary eligibility requirement and the skill-set.

MCA First Year

Semester-I

Paper Code	Course	External Marks	Internal Marks	Total Marks	Credits
20MCA21C1	Object Oriented Programming Using JAVA	80	20	100	4:0:0
20MCA21C2	Compiler Design	80	20	100	4:0:0
20MCA21C3	Computer Graphics & Multimedia	80	20	100	4:0:0
20MCA21C4	Digital Design & Computer Architecture	80	20	100	4:0:0
20MCA21C5	Advance Data Structures Using C++/Java	80	20	100	4:0:0
20MCA21CL1	Software Lab -1 Based on 20MCA21C1, 20MCA21C2 & 20MCA21C3	100*	----	100	0:0:3
20MCA21CL2	Software Lab -2 Based on 20MCA21C4 & 20MCA21C5	100*	----	100	0:0:3
Total					**Credits 26**

Semester-II

Paper Code	Course	External Marks	Internal Marks	Total Marks	Credits
20MCA22C1	Advance Object Technology	80	20	100	4:0:0
20MCA22C2	Advance Database Systems & Data Warehouse	80	20	100	4:0:0
20MCA22C3	Operating Systems & Shell Programming	80	20	100	4:0:0
	Elective-I				
20MCA22DA1/	i) Theory of Computation	80	20	100	4:0:0
20MCA22DA2/	ii) Computer Networks & Distributed Systems	80	20	100	4:0:0
20MCA22DA3/	iii) Web Technologies	80	20	100	4:0:0
	Elective-II				
20MCA22DB1/	i) Cloud Computing	80	20	100	4:0:0
20MCA22DB2/	ii) Software Engineering	80	20	100	4:0:0
20MCA22DB3/	iii) Advance Computer Architecture & Quantum Computing	80	20	100	4:0:0
20MCA22CL1	Software Lab-3 Based on 20MCA22C1 & Elective I and/or II	100*	----	100	0:0:3
20MCA22CL2	Software Lab-4 Based on 20MCA22C2 & 20MCA22C3	100*	----	100	0:0:3
20MCA22C4	Industry Internship Report/ Project Report/Dissertation –I	100**	----	100	0:3:0
Total					**Credits 29**
	Foundation Electives (O)				
	To be Chosen from the pool of Foundation Electives provided by the university.				**2**

Total Credits= 31 Credits

*20 marks out of 100 will be based on the attendance, evaluation/assessment of the candidate in Test(s) and Assignment(s) during the semester, which will be forwarded by the Head of Dept./Director to the Examiner(s). Further, both practical exams of a semester may be conducted on the same day in 2 sittings each maximum of 3 hours.

**20 marks out of 100 will be based on evaluation/assessment of the candidate by the internal supervisor.

With effect from the Session 2021-22

MCA Second Year

Semester-III

Paper Code	Course	External Marks	Internal Marks	Total Marks	Credits
21MCA23C1	Data Mining & Big Data Analytics	80	20	100	4:0:0
21MCA23C2	Artificial Intelligence & Computational Intelligence	80	20	100	4:0:0
21MCA23C3	Android Mobile Application Development	80	20	100	4:0:0
	Elective-I				
21MCA23DA1/	i) Computer Vision	80	20	100	4:0:0
21MCA23DA2/	ii) Software Testing & Quality Assurance	80	20	100	4:0:0
21MCA23DA3/	iii) Mixed Reality & Wearable Computing	80	20	100	4:0:0
	Elective-II				
21MCA23DB1/	i) Network Programming	80	20	100	4:0:0
21MCA23DB2/	ii) Natural Language Processing & Speech Recognition	80	20	100	4:0:0
21MCA23DB3/	iii) Bioinformatics Computing	80	20	100	4:0:0
21MCA23CL1	Software Lab-5 Based on 21MCA23C1&21MCA23C3	100*	----	100	0:0:3
21MCA23CL2	Software Lab-6 Based on 21MCA23C2, Elective I & II	100*	----	100	0:0:3
Total					**Credits 26**
	Open Elective (O)				
	To be Chosen from the pool of Open Electives provided by the University (excluding the open elective prepared by the Department of Comp Sc. & Appls.)				**3**

Total Credits= 29 Credits

*20 marks out of 100 will be based on the attendance, evaluation/assessment of the candidate in Test(s) and Assignment(s) during the semester, which will be forwarded by the Head of Dept./Director to the Examiner(s). Further, both practical exams of a semester may be conducted on the same day in 2 sittings each maximum of 3 hours.

Semester-IV

Paper Code	Course	External Marks	Internal Marks	Total Marks	Credits
21MCA24C1	Advance Software Engineering	80	20	100	4:0:0
21MCA24C2	IoT & Sensor Networks	80	20	100	4:0:0
21MCA24C3	Web Development Using .NET Framework	80	20	100	4:0:0
	Elective-I				
21MCA24DA1/	i) Cyber Security & Blockchain Technology	80	20	100	4:0:0
21MCA24DA2/	ii) Edge and Fog Computing	80	20	100	4:0:0
21MCA24DA3/	iii)High Speed Networks	80	20	100	4:0:0
	Elective-II				
21MCA24DB1/	i) Machine Learning & Python Programming	80	20	100	4:0:0
21MCA24DB2/	ii) Web Development Using PHP	80	20	100	4:0:0
21MCA24DB3/	iii) Neural Networks & Deep Learning	80	20	100	4:0:0
21MCA24CL1	Software Lab-7 Based on 21MCA24C1, 21MCA24C2 & Elective II	100*	----	100	0:0:3
21MCA24CL2	Software Lab-8 Based on 21MCA24C3 & Elective I	100*	----	100	0:0:3
21MCA24C4	Industry Internship Report/ Project Report/ Dissertation –II	100**	----	100	0:3:0
Total					**Credits 29**
	Grand Total of 2 Years' Credits				**Credits 115**

*20 marks out of 100 will be based on the attendance, evaluation/assessment of the candidate in Test(s) and Assignment(s) during the semester, which will be forwarded by the Head of Dept./Director to the Examiner(s). Further, both practical exams of a semester may be conducted on the same day in 2 sittings each maximum of 3 hours.

**20 marks out of 100 will be based on evaluation/assessment of the candidate by the Internal Supervisor.

SYLLABUS FOR BRIDGE COURSE (MCA 2-Year Programme)

20BCC11C1: COMPUTER FUNDAMENTALS AND PROGRAMMING IN C

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand computer basics and role of operating system.

CO2: Learn about concept of computer network, Internet and social impacts of IT.

CO3: Gain understanding of PC Software Tools – Word, Excel and Power-Point.

CO4: Design an algorithm and draw flowchart for simple problems.

CO5: Develop C programs implementing all features of C.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Computer Fundamentals: Concept of data and information, Historical evolution of computers, Block Diagram of Computer and working, Characteristics, Classification of Computers, Advantages and Limitations of Computer, Applications of Computer, I/O Devices, Memory and Storage Devices; **Computer Software:** System and Application Software.

Operating System: Characteristics, bootstrapping, types of Operating System, Operating System as resource manager. **Programming Languages**: Machine, Assembly, High Level Language, 4GL. Language Translator, System Utilities- Editor, Linker, Loader, File Manager.

Computer Network Concepts: Definition, Types of Network, Topology, Protocols, Intranet, Extranet, Internet, WWW, Search Engine, Web Browsers, Services of Internet. IT and Social Impacts of IT: Positive and Negative Impacts, Computer Crimes, Viruses and their remedial solutions.

UNIT-II

MS-Word: Introduction, Windows Interface, Customizing the Word Application, Document Views, Basic Formatting in MS Word, Advanced Formatting, Navigating through a Word Document, Performing a Mail Merge, A Quick Look at Macros, Printing Documents, Print Preview

MS-Excel: Introduction, Workbook, Worksheet, Formatting in excel, Advanced formatting in Excel, Working with formulas, Printing worksheets

MS-PowerPoint: Introduction, Creating a Presentation, Basic Formatting in PowerPoint, Advanced Formatting, Using Templates, Inserting charts, Inserting tables, Printing presentations.

UNIT-III

Problem Solving: Problem Identification, Analysis, Algorithms, Flowcharts, Pseudo codes, Decision Tables, Program Coding, Program Testing and Execution.

C Programming Fundamentals: Basic Concepts, Structure of a C program, Operators & Expressions; Library Functions, Decision making using if…else, Else If Ladder; Switch, break, Continue and Goto statements, Control Statements: Looping using while, do…while, for statements, Nested loops.

Arrays & Functions: Declaration and Initialization, Multidimensional Arrays, String: Operations of Strings, Functions: Defining & Accessing User defined functions, Function Prototype, Passing Arguments, Passing array as argument, Recursion, Use of Library Functions, Macro vs. Functions.

UNIT-IV

Pointers: Declarations, Operations on Pointers, Passing to a function, Pointers & Arrays, Array of Pointers, Array accessing through pointers, Pointer to functions, Function returning pointers, Dynamic Memory Allocations.

Structures and Union: Defining and Initializing Structure, Array within Structure, Array of Structure, Nesting of Structure, Pointer to Structure, Passing structure and its pointer to Functions, Unions: Introduction to Unions and its Utilities.

File Handling: Opening and closing file in C, Create, Read and Write data to a file, Modes of Files, Operations on file using C Library Functions, Working with Command Line Arguments, Program Debugging and types of errors.

Suggested Readings:

1. Gill Nasib Singh: Computing Fundamentals and Programming in C, Khanna Books Publishing Co., New Delhi.
2. Kenneth. A.: C problem solving and programming, Prentice Hall.
3. Gottfried, B.: Theory and problems of Programming in C, Schaum Series.
4. Gill, Nasib Singh: Handbook of Computers, Khanna Books Publishing Co., New Delhi.
5. Sanders, D.: Computers Today, Tata McGraw-Hill.
6. Rajender Singh Chhillar: Application of IT to Business, Ramesh Publishers, Jaipur.
7. Cooper, Mullish: The spirit of C, An Introduction to Modern Programming, Jaico Publ. House, New Delhi.
8. Kernighan & Ritchie: The C Programming Language, PHI.
9. Gottfried, B.: Theory and problems of Programming in C, Schaum Series.
10. E. Balaguruswamy: Programming in C, Tata McGraw Hill.
11. H. Schildt: C-The Complete Reference, Tata McGraw Hill.
12. Y. Kanetkar: Let us C, BPB Publication
13. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

20BCC11C2: C++ AND DATA STRUCTURES

Course Outcomes:
By the end of the course the students will be able to:
CO1: Understand concept of object oriented programming and its features.
CO2: Gain insights about C++ features and access specifiers.
CO3: Able to understand importance of polymorphism and inheritance.
CO4: Learn to analyze algorithms on basis of their performance.
CO5: Ability to use stack, queue and linked list data structures.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Introduction to OOP: Concept of OOP, Procedural vs. Object oriented programming, Characteristics of OOP: Objects, classes, Encapsulation, Data Abstraction, Inheritance, Polymorphism, Dynamic Binding, and Message Passing.

C++ Programming: Data-types, Variables, Static Variables, Operators in C++, Arrays, Strings, Structure, Functions, Recursion, Control Statements.

Access Specifies: Private, Public and Protected, Member functions of the class, Constructor and Destructor, Parameterized Constructor, Copy Constructors.

UNIT-II

Inheritance: Reusability, Types of Inheritance: Single inheritance, Multiple, Multilevel, Hybrid Inheritance, Public, Private, and Protected Derivations.

Polymorphism: Function Overloading, Static Class Members, Static Member Functions, Friend Functions.

Operator Overloading: Unary and Binary Operator Overloading, Abstract class, Virtual function, pure virtual function, Overloading vs. Overriding.

Memory management: new, delete, object Creation at Run Time. **Exception handling:** Throwing, Catching, and Re-throwing an exception.

UNIT-III

Design and Analysis of Algorithm: Algorithm definition, comparison of algorithms. Top down and bottom up approaches to Algorithm design.

Introduction to Data Structures: Concept of Data Structure, Types of Data Structure: Primitive and non–primitive.

Arrays: Single and Multidimensional arrays. Address calculation using column and row major ordering. Various Operations on arrays. Applications of arrays.

Sorting: Selection sort, Insertion sort, Bubble sort, Quick sort, merge sort, Radix sort. Searching: Sequential and binary search, Indexed search, Hashing Schemes. Comparison of time complexity.

UNIT-IV

Stacks and Queues: Representation of stacks and queues using arrays and linked-list. Applications of stacks: Conversion from infix to postfix and prefix expressions, Evaluation of postfix expression using stacks.

Linked list: Singly linked list; operations on list, Linked stacks and queues. Polynomial representation and manipulation using linked lists. Circular linked lists, Doubly linked lists.

Applications of Stack, Queue and Linked List data structures.

Suggested Readings:

1. Herbert Schildt: C++ - The Complete Reference, Tata McGraw Hill Publications
2. E. Balaguruswamy: C++, Tata McGraw Hill Publications.
3. E. Balaguruswamy: Object Oriented Programming and C++, TMH.
4. Shah & Thakker: Programming in C++, ISTE/EXCEL.
5. Johnston: C++ Programming Today, PHI.
6. Olshevsky: Revolutionary Guide to Object Oriented Programming Using C++, SPD/WROX.
7. R.Rajaram: Object Oriented Programming and C++, New Age International.
8. Samanta: Object Oriented Programming with C++ & JAVA, PHI.
9. Subburaj: Object-Oriented Programming with C++, VIKAS Publishing House.
10. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

20BCC11C3: VISUAL BASIC & DATABASE SYSTEMS

Course Outcomes:

By the end of the course the students will be able to:

CO1: Design, create, build, and debug Visual Basic applications & explore Visual Basic IDE.

CO2: Implement syntax rules of different constructs/components in Visual Basic programs & connectivity with database.

CO3: Understand the concepts of database & its models.

CO4: Comprehend the concept of relational model and different forms of Normalization.

CO5: Get the knowledge of Transaction Management and concurrency control.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Introduction to Visual Basic: VB IDE, An overview of VB project types, VB as event-driven & object-based language, Default Controls in Tool Box: Label Box, Text Box, Command Button, List Box, Combo Box, Picture & Image Box, Shape box, Timer, Option button, Check Box & Frames. Exploring Project Properties.

Programming with VB: Variables, Constants, Data types, Variable Scope, Arithmetic operations, String Operations, Built-in functions, I/O in VB, Branching & Looping statements, Procedures, Arrays, Collection.

UNIT-II

Working with Forms: Working with multiple forms; Loading, Showing and Hiding forms; Creating Forms at Run Time, Drag and Drop operation, MDI form, Arranging MDI Child Windows, Coordinating Data between MDI Child Forms.

Dialog Boxes and Menu: Using Common Dialog Box; Adding Menu, Modifying and Deleting Menu Items, Creating Submenus.

VB & Databases: The Data Controls and Data-Bound Controls; Using DAO, RDO, ADO.

UNIT –III

Database Management System: Introduction, Database System Applications, History of Database Systems, Database System Vs. File Processing System, View of Data, Data Abstraction, Instances and Schemas. DBMS Environment, Database languages, Database Models. **Database design and ER Model**: Physical, Conceptual and Logical Database design, ER Modelling, Conceptual design with ER Model

Relational Model: Introduction to the Relational Model, Integrity Constraint Over relations, Enforcing Integrity constraints, Querying relational data, View: Introduction to Views, Destroying / altering Views. **Relational Algebra and Calculus:** Relational Algebra & its operations, Relational calculus & its types, Power of Algebra and calculus.

Lab Problem(s): ***Creation and Querying relational data with SQL***

UNIT-IV

Normalization: Schema Refinement, Problems caused by redundancy, Decomposition & its properties; Normalization: FIRST, SECOND, THIRD Normal forms, BCNF, Multivalued Dependencies, Join Dependencies.

Transaction Management & Concurrency Control: ACID properties, Transactions and Schedules, Concurrent execution of transaction, Serializability and Recoverability, Lock based Concurrency control, Lock Management, Lock Conversion, Dealing with deadlocks, Concurrency without Locking

Suggested Readings:

1. Steven Holzner: Visual Basic 6 Programming: Black Book,Dreamtech PRESS.
2. EvangelosPetroutsos: Mastering Visual Baisc 6,BPB.
3. Julia Case Bradley & Anita C.:Millspaugh Programming in Visual Basic 6.0,Tata McGraw-Hill.
4. Michael Halvorson,:Step by Step Microsoft Visual Basic 6.0 Professional,PHI.
5. Scott Warner:Teach Yourself Visual basic 6, Tata McGraw-Hill Edition.
6. Elmasri & Navathe:Fundamentals of Database Systems,5th edition, Pearson Education.
7. Thomas Connolly, Carolyn Begg: Database Systems, Pearson Education.
8. C. J. Date: An Introduction to Database Systems, 8th edition, Addison Wesley N. Delhi.
9. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

SYLLABUS FOR MCA 2-YEAR PROGRAMME

MCA FIRST YEAR

20MCA21C1: OBJECT ORIENTED PROGRAMMING USING JAVA

Course Outcomes:

By the end of the course the students will be able to:

CO1: Use the characteristics of Java language in a program. Use variables and data types in program development.

CO2: Identify and implement arrays, String and Selection Statements.

CO3: Write Java programs using object-oriented programming techniques including classes, objects, methods, instance variables, interface.

CO4: Design and implementation programs of Exception handling, Packages.

CO5: Design and implementation programs of Multithreading Programming, Window based programs.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Introduction: Genesis and Evolution of Java Language, Internet & Java, Byte-code, its Features, Java Program Structure and Java's Class Library, Data Types, Variables, and Operators, Operator Precedence; Selection Statements, Scope of Variable, Iterative Statement; Defining Classes & Methods, Creating Objects of a Class, Defining and Using a Class, Automatic Garbage Collection.

Arrays and Strings: Arrays, Arrays of Characters, String Handling Using String Class, Operations on String Handling Using, String Buffer Class.

UNIT-II

Classes and Inheritance: Using Existing Classes, Class Inheritance, Choosing Base Class, Multiple Levels of Inheritance, Abstraction through Abstract Classes, Using Final Modifier.

Packages: Understanding Packages, Defining a Package, Packaging up Your Classes, Adding Classes from a Package to Your Program, Understanding CLASSPATH, Standard Packages, Access Protection in Packages.

Interface Fundamentals: Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Final Thoughts on Interfaces.

UNIT-III

Exception Handling: The concept of Exceptions, Types of Exceptions, Dealing with Exceptions, Exception Objects, Defining Your Own Exceptions.

Multithreading Programming: The Java Thread Model, Understanding Threads, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization.

Input/Output in Java: I/O Basic, Byte and Character Structures, I/O Classes, Reading Console Input Writing Console Output, Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File, Stream Benefits.

UNIT-IV

Applets in Java: Applet Basics, Applet Architecture, Applet Life Cycle, Simple Applet Display Methods, The HTML APPLET Tag Passing Parameters to Applets.

Working with Windows: AWT Classes, Window Fundamentals, Working with Frame, Creating a Frame Window in an Applet; Displaying Information within a Window.

Working with Graphics and Text: Working with Graphics, Working with Color, Setting the Paint Mode, Working with Fonts, Managing Text Output; Using Font Metrics, Exploring Text and Graphics, Working with AWT Controls, Layout Managers and Menus.

Suggested Readings:

1. The Complete Reference JAVA, TMH Publication.
2. Beginning JAVA, Ivor Horton, WROX Public.
3. JAVA 2 UNLEASHED, Tech Media Publications.
4. JAVA 2(1.3) API Documentations.
5. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

20MCA21C2: COMPILER DESIGN

Course Outcomes:

By the end of the course the students will be able to:

CO1: Elaborate concepts compilation process and apply in various fields of computer languages.

CO2: Explain the lexical and syntactical analysis phase of compilation.

CO3: Solve theoretical problems related to parsers and develop parsers.

CO4: Evaluate codes for generation of intermediate code and apply possible code optimizations.

CO5: Design and develop system programs as well as for compilers for varying needs.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Evolution of Systems Programming: Introduction to System programs, Overview of Assemblers, Loaders, Linkers, Macros, Compilers. **System Software Tools:** Variety of software tools, Text editors, Interpreters and program generators, Debug Monitor, System Programming environment.

Loader Schemes: Compile and Go Loader, general loader schemes, Absolute Loader, Subroutine linkage, Reallocating Loader, Direct Linkage Loader, Binders, Linking loader, overlays.

UNIT-II

Compiler: Phases of Compiler, Compiler writing tools, Lexical Analysis, Finite Automata, Regular Expression, From a Regular expression to an NFA, NFA to DFA, Design of Lexical Analyzer. Syntax Analyzer, CFG, Role of the Parser, CFG, Top Down Parsing, Recursive Descent parsing, predictive Parsers, Bottom up Parsing, Shift reduce, Operator Precedence parsers, LR Parsers.

UNIT-III

Intermediate Code: Syntax directed definitions, Evaluation Orders of Syntax directed definitions; Intermediate Languages: Intermediate code generation, Syntax trees, Construction of Syntax trees, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Postfix form. Symbol table: Contents of Symbol table, Data Structures for Symbol table; Runtime Storage Administration.

UNIT-IV

Code Optimization and Code Generation: Principal sources of optimization, loop optimization, DAG - Optimization of Basic Blocks, Global Data Flow Analysis – Efficient Data Flow Algorithm. Code Generation: Issues in code generation, Design of a simple Code Generator, Register allocation and Assignment, Peephole optimization.

System & Compiler programming: Developing system programs using C for basic OS commands apart from developing programs for lexical analysis, token counts, symbol table generator, memory storage requirement evaluator for identifiers for one or multiple declarative statements.

Suggested Readings:

1. Donovan: Systems Programming, Tata McGraw Hill.
2. Dhamdhere: System Software, Tata McGraw Hill.
3. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman: Compilers Principles, Techniques and Tools, Addison Wesley.
4. Alfred V.Aho and Jeffrey D.Ullman: Principles of Compiler Design, Addison Wesley.
5. William M. Waite, Gerhard Goos: Compiler Construction.
6. Joseph Rodrix: Compiler Design With C/C++, Kindle Book, ASIN: B0727Q9NBK.
7. Torben Ægidius Mogensen: Basics of Compiler Design, ISBN 978-87-993154-0-6.
8. Bergmann, Seth D.: Compiler Design: Theory, Tools, and Examples.
9. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

20MCA21C3: COMPUTER GRAPHICS & MULITMEDIA

Course Outcomes:

By the end of the course the students will be able to:
CO1: Understand basic of computer graphics, display devices and graphics standards.
CO2: Learn about graphics primitives and their importance.
CO3: Understand 2D transformations and representation of 3D objects.
CO4: Learn about 3D transformations, hidden surfaces and color models.
CO5: Understand about multimedia authoring and create a multimedia project using Flash/Blender multimedia software.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Basics of Computer Graphics: Computer Graphics, Classification, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards.

Graphics Primitives: Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-

outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers.

UNIT-II

2D Transformation and Viewing: Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping.

3D Concepts and Object Representation: 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces.

UNIT-III

3D Transformation and Viewing: 3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations. **Modelling:** Wireframe and Solid.

Hidden Surfaces: Visible surface detection concepts, Back-face detection, Depth Buffer method, Illumination, Light sources, Illumination methods (ambient, diffuse reflection, specular reflection). **Color models:** properties of light, XYZ, RGB, YIQ and CMY color models. **Shading:** Flat, Gouraud and Phong.

UNIT-IV

Multimedia Basics: Concepts of Multimedia, Multimedia applications, Multimedia system architecture, Evolving technologies for multimedia, Defining objects for multimedia systems, Multimedia data interface standards, Multimedia databases. **Compression and decompression:** Data and file format standards, Multimedia I/O technologies, Digital voice and audio, Video image and animation, Full motion video, Storage and retrieval technologies.

Multimedia Authoring: Concept of Multimedia Authoring, Hypermedia messaging, Mobile messaging, Hypermedia message component, Creating hypermedia message, Integrated multimedia message standards, Integrated document management, Distributed multimedia systems.

Case Study (FLASH/ BLENDER): Drawing Basic Shapes, Modeling, Shading & Textures, Creating a multimedia project.

Suggested Readings:

1. Donald Hearn and M.Pauline Baker: Computer Graphics, PHI Publications
2. Plastock : Theory & Problem of Computer Graphics, Schaum Series.
3. Foley & Van Dam: Fundamentals of Interactive Computer Graphics, Addison-Wesley.
4. Newman : Principles of Interactive Computer Graphics, McGraw Hill.
5. Tosijasu, L.K. : Computer Graphics, Springer-Verlag.
6. S Gokul: Multimedia Magic, BPB Publication.
7. Bufford: Multimedia Systems, Addison Wesley.
8. Jeffcoate : Multimedia in Practice, Prentice-Hall.
9. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

20MCA21C4: DIGITAL DESIGN & COMPUTER ARCHITECTURE

Course Outcomes:

By the end of the course the students will be able to:

CO1: Implement digital functions in the form a digital logic and perform binary arithmetic operations

CO2: Identify and implement commonly used sequential and combinational circuits

CO3: Basic computer design and developing 8086/8088 A/L programs for small applications

CO4: Implement CPU design and Input/Output organization

CO5: Understand advanced computer architectural aspects and parallel designs

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Number System: Binary, Octal, Hexadecimal and Decimal, 1's and 2's Complements, Inter-conversion of numbers. Codes: Weighted and Non-weighted codes, BCD Codes, Gray codes, Self-complementing codes, Error-Detecting/Correcting codes, Alphanumeric Codes, Hamming Codes, Floating Point Numbers. Binary Arithmetic: Binary Addition and Subtraction, 2's Complement Arithmetic, Booth Coding, Binary Multiplication.

Logic Design: Logic Gates, Truth Tables, Boolean Algebra, Boolean Expressions-Variables and Literals, Boolean Expressions–Equivalent and Complement, Theorems of Boolean Algebra, Simplification Techniques, SOPs & POSs Boolean Expressions.

UNIT-II

Combinational Circuits: Combinational Logic, Arithmetic Circuits– Adder and Subtractor, BCD Adder, Code Converters, Magnitude Comparator, Parity Generators/Checkers, Multiplexers, Demultiplexers, Decoders, Encoders.

Sequential Circuits: Latches, R S Flip Flop, Level Triggered and Edge Triggered Flip Flops, JK Flip-Flop, Master-Slave Flip Flops, T Flip-Flop, D Flip-Flops.

Registers and Counters: Controlled Buffer Registers, Shift Registers, Applications of Shift-registers; Ripple Counter, Synchronous Counter, Modulus Counter, Binary Ripple Counters, Up/Down Counters, Decade and BCD Counters.

UNIT-III

Basic Computer Design: Computer Instructions and types, Instruction Set, Instruction Cycle, Instruction Formats, Addressing Modes, Computer Registers, Bus System, Register Transfer Language terminology.

Programming in 8086/8088 Assembly Language: A/L program structure, segments, registers, instructions, macros, A/L directives.

CPU Design: CPU Registers, Micro-operations and its types, Design of ALU. Control Unit Design- Microprograms, Control Unit of a basic computer–Timing and Control; Hardwired and Micro-programmed controlled unit. Architectures -RISC, CISC, Scalar, Superscalar and pipelined architectures.

UNIT-IV

Input/Output Organization: Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Mode of Transfer, Priority Interrupt, Direct Memory Access, Input-output Processor, Serial Communication.

Advance Architecture: Introduction to parallel processing– Pipelining, Parallel Computer structures, Architectural classification. Pipelining & Vector processing; Instruction and Arithmetic pipelines, Principles of designing pipelined processors, Structures for array processors: SIMD Array processor, SIMD Interconnection networks. Parallel Processing Applications.

SuggestedReadings:

1. Mano,M.M.:Digital Logic and Computer Design, Prentice-Hall of India.
2. Gill Nasib Singh and Dixit J.B: Digital Design and Computer Organisation, University Science Press (Laxmi Publications),New Delhi.
3. Stallings,William: Computer Organisation &Architecture.
4. Mano,M.M.:Digital Design, Prentice-Hall of India.
5. Anand Kumar:Fundamentals of Digital Circuits, PHI.
6. Kai Hwang: Advanced Computer Architecture, McGraw Hill International
7. Mano,M.M.:Computer System Architecture, Prentice-Hall of India.
8. Tokheim:Digital Electronics, TMH.
9. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

20MCA21C5: ADVANCE DATA STRUCTURES USING C++/JAVA

Course Outcomes:

By the end of the course the students will be able to:

CO1: To learn about analyzing and designing algorithms to solve a problem and learn to find the asymptotic efficiency of an algorithm.

CO2: To study about binary tree and its applications.

CO3: To learn advanced data structures such as balanced search trees and heap hash operations.

CO4: To learn about graphs & its algorithms such as

CO5: To study various graph processing algorithms and Algorithm Design techniques

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will

be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-1

The Role of Algorithms in computing: Analyzing Algorithms, Time and Space Analysis of Algorithms, Big-Oh and Theta Notations, Average, Best and Worst case analysis. Designing Algorithms, Growth of functions. Asymptotic Notations, Divide and Conquer, Recurrences, Maximum sub-array problem, Stressan's Method, Substitution method, Recurrence tree method, The Master method, Floors and Ceilings.

UNIT-II

Trees : Binary tree traversal methods: Pre-order, In-order, Post-ordered traversal. Recursive Algorithms. Traversal methods. Representation of trees and its applications: Binary tree representation of a general tree. Conversion of forest into tree. Threaded binary trees. Binary search tree: Height balanced (AVL) tree, B-trees, Splay tree. Heap: Heap operations, Binomial heaps, Fibonacci heaps, Skew heaps, heap set.

UNIT-III

Graphs & Algorithms: Representation, Type of Graphs, Paths and Circuits: Euler Graphs, Hamiltonian Paths & Circuits; Cut-sets, Connectivity and Separability, Planar Graphs, Isomorphism, Graph Coloring, Covering and Partitioning, , Depth-and breadth-first traversals, Minimum Spanning Tree: Prim's and Kruskal's algorithms, Shortest-path Algorithms: Dijkstra's and Floyd's algorithm, Topological sort, Maxflow: Ford-Fulkerson algorithm, max flow –min cut.

UNIT-IV

Dynamic Programming: Backtracking Algorithms, Design Methodologies, Travelling salesperson problem, 0/1 Knapsack problem, multistage graphs, All Pair Shortest Path, 8-Queens problem Advanced String Matching Algorithms: Naïve string matching algorithm, Robin-Karp algorithm, string matching with finite automata, Knuth-Morris-Pratt algorithm.

P, NP and Approximation Algorithms: Basic Concepts, Non Deterministic algorithms, NP Complete and NP-hard classes, NP complete Problems.

Implementation of above mentioned data structures & algorithms through C++/Java programming.

Suggested Readings

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest: Introduction to Algorithms, PHI Learning Pvt. Ltd.
2. Gilles Brassard, Paul Bratley: Fundamentals of Algorithms, PHI Learning Pvt. Ltd, 2011.
3. Hubbard JR: Schaum's Outline of Data Structures with C++, Tata McGraw Hills, New Delhi.
4. R. Sedgewick: Algorithms in C++, Pearson Education Asia.
5. Y.Langsam, M.J.Augenstein and A.M.Tanenbaum: Data Structures Using C and C++, Prentice Hall of India.
6. R.Kruse, C.L.Tonodo and B.Leung: Data Structures and Program Design in C, Pearson Education. New Delhi
7. G.L. Heileman: Data Structutes: Algorithms and Object Oriented Programming,

Tata McGraw Hill, New Delhi
8. E. Horowitz, Sahni and D. Mehta: Fundamentals of Data Structures in C++, Galgotia Publication, New Delhi.
9. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

20MCA22C1: ADVANCE OBJECT TECHNOLOGY

Course Outcomes:

By the end of the course the students will be able to:

CO1: Explain the use of DHTML and XML in data exchange.

CO2: Analyze and use various AWT controls and event handling for development of a Applet.

CO3: Use of Swing components for the web application development.

CO4: Develop applications using Servlets, parameter passing and concept of session maintenance.

CO5: Design and develop basic JSP applications.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script. XML: Document type definition, XML Schemas, Document Object model, Presenting XML, Review of Applets, Class, Event Handling, AWT Programming.

UNIT-II

Introduction to Swing, Differences between AWT Controls & Swing Controls, JApplet, Swing Button: JButton, JToggleButton, CheckBoxes, Radio Button, JComboBox, Text Boxes etc., Icons, Labels, JTabbed Pains, JScroll Pains, JList, JTrees, JTables Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK Introspection, Developing a Home page using Applet & Swing.

UNIT-III

Introduction to Servlets: Lifecycle of a Servlet, The Servlet API, The javax. Servlet Package, Reading Servlet parameters, Reading Initialization parameters; The javax.servlet HTTP package, Handling Http Request & Responses, Security Issues Introduction to JSP, Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment: Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat.

UNIT-IV

JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations Introduction to struts framework, RMI, CGI programming.

Suggested Readings:

1. Dietel and Nieto: Internet and World Wide Web – How to program?, PHI/Pearson Education Asia.
2. Patrick Naughton and Herbert Schildt: The Complete Reference Java, Tata McGraw-Hill.
3. Hans Bergstan: Java Server Pages.
4. Bill Siggelkow, S P D O'Reilly: Jakarta Struts, Cookbook.
5. Murach: Murach's beginning JAVA JDK 5, SPD.
6. Wang-Thomson: An Introduction to Web Design and Programming.
7. Knuckles: Web Applications Technologies Concepts- John Wiley.
8. Sebesta: Programming world wide web, Pearson.
9. Building Web Applications-NIIT,PHI.
10. Bai/Ekedaw-Thomas: Web Warrior Guide to Web Programmming.
11. Jon Duckett: Beginning Web Programming, WROX.
12. Pekowsky, Java Server Pages, Pearson.
13. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

20MCA22C2: ADVANCE DATABASE SYSTEMS & DATA WAREHOUSE

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand the difference between ER and EER model.

CO2: Understand the concepts of OODBMS and ORDBMS.

CO3: Know about parallel and distributed database and Client-Server architecture.

CO4: Understand Emerging database based on the types of data.

CO5: Know about the concepts of data warehouse, its types, architecture and schema.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT – I

Introduction to Advance Database Systems: Overview of advance database systems, their importance and Applications; **EER Model** -The ER model revisited, EER model: Super classes, Subclasses, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization, Category.

Object Model: Overview of Object-Oriented concepts, Object identity, Object structure, Type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance, Complex objects, Schema design for OODBMS, OQL, Persistent

Programming language, OODBMS architectures and storage issues, Transaction and concurrency control.

Object Relational Database and Information Retrieval: Database design for an ORDBMS – Nested relations and collections; Storage and access methods, Query processing and Optimization, Advance Querying: User define data types, manipulating objects table, object views; Information Retrieval & ways to retrieve information.

UNIT - II

Parallel Database: Architectures for parallel databases, Inter and Intra Query parallelism, Inter and Intra Query operations, Parallelizing individual operations, Sorting, Joins, Pipelining.

Distributed Database: Architectures for Distributed Database, Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design, Query processing in Distributed Databases; Concurrency Control and Recovery in Distributed Databases.

Overview of Client Server Architectures: Centralized and Client-Server architectures, Server architectures.

UNIT-III

Enhanced Data Models for Advanced Applications: Active database- syntax and semantics (DB2, Oracle), applications, design principles for active rules, Temporal database concepts, Spatial databases, Deductive databases.

Emerging Database Technologies: Mobile databases, Multimedia Databases, Geographic Information systems (GIS); XML and Internet Databases: Structured, Semi-structured and Unstructured Data, Introduction to web databases and XML, Structure of XML data.

UNIT – IV

Data Warehouse and OLAP Technology: Need for data warehouse, Definition, Goals of data Warehouse, Challenges faced during Warehouse Construction, Advantages, Types of Warehouse: Data Mart, Virtual Warehouse and Enterprise Warehouse; Components of Warehouse: Fact data, Dimension data, Fact table and Dimension table, Designing fact tables; Pre-requisite Phases: Extract, Transform and load process; Warehouse Schema: star, snowflake and galaxy schemas; OLTP vs OLAP, Strengths of OLAP, Applications of OLAP.

Multidimensional data models: Data Cubes & Data Cuboids, Lattice; OLAP operations: Advantages, Types: Roll up, Drill down, Pivot, Slice & Dice operations, Applications; OLAP Server: Need, Types: ROLAP, MOLAP and HOLAP, Features; Data Warehouse Implementation, Introduction to Efficient computation of data cubes.

Suggested Readings:

1. Elmasri and Navathe: Fundamentals of Database Systems, Pearson Education.
2. Korth, Silberchatz, Sudarshan: Database System Concepts, McGraw-Hill.
3. Raghu Ramakrishnan, Johannes Gehrke: Database Management Systems, McGraw-Hill
4. Peter Rob and Coronel: Database Systems, Design, Implementation and Management, Thomson Learning.
5. C.J.Date, Longman: Introduction to Database Systems, Pearson Education

6. Thomas Connolly, Carolyn Begg: Database Systems, Pearson Education
7. W.H.Inmon: Building Data Ware House, John Wiley & Sons.
8. S . Anahory and D.Murray: Data warehousing, Pearson Education, ASIA.
9. Jiawei Han & Micheline Kamber: Data Mining - Concepts & Techniques: Harcourt India PVT Ltd. (Morgan Kaufmann Publishers).
10. Michall Corey, M.Abbey, I Azramson & Ben Taub: Oracle 8i Building Data Ware Housing, TMH.
11. A.K. Pujari: Data Mining Techniques, University Press.
12. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

20MCA22C3: OPERATING SYSTEMS & SHELL PROGRAMMING

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand basic concepts of Operating Systems and their structure.
CO2: Learn about concept of processes and process scheduling.
CO3 Understand about interprocess communication and role of semaphores.
CO4: Learn in detail about Deadlock, memory management and I/O management.
CO5: Understand Linux basics and Shell programming.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Operating System Basics: Evolution, Objectives & Functions, Characteristics; Classification of Operating Systems, OS Services, System Calls, OS Structures, Concept of Virtual Machine.

Process Concepts: Definition, Process Relationship, Process states, Process State transitions, Process Control Block ,Context switching – Threads – Concept of multithreads , Benefits of threads – Types of threads.

Process Scheduling: Definition, Scheduling objectives, Types of Schedulers, Scheduling criteria. **Scheduling Algorithms:** Preemptive and Non-preemptive, FCFS–SJF–RR, **Multiprocessor scheduling:** Types, Performance evaluation of the scheduling.

UNIT-II

Interprocess Communication: Race Conditions, Critical Section, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson’s Solution, Producer Consumer Problem,

Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem.

Deadlocks - System Model, Deadlock Principles, Deadlock Characterization, Methods for Handling Deadlocks Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

UNIT-III

Memory Management: Basic Memory Management, Logical and Physical address map, Memory allocation, Fragmentation and Compaction, Paging and its disadvantages, Virtual Memory, Locality of reference, Page Fault, Working Set , Demand paging concept, Page Replacement policies.

Input/Output Management: I/O devices, Device controllers , Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms.
File Management: File concept, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods.

UNIT-IV

Linux Basics: Genesis of Linux, Architecture of Linux, Features of Linux, Introduction to vi editor, Linux commands. Linux Shells: Role, Types- Bourne Shell (sh), C Shell (csh), Korn Shell (ksh), Bourne Again Shell (bash).

Linux Utilities: File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text Processing utilities and backup utilities.

Shell programming (With bash): Introduction, shell responsibilities, pipes and Redirection, Running a shell scripts, The shell as a programming language, Shell meta characters, File name substitution, Shell variables, Command substitution, Shell commands, The environment, Quoting, Test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

Suggested Readings:

1. Silberschatz & Galvin: Operating System Concept, Wiley.
2. Milan Milenkovic: Operating Systems, Tata McGraw – Hill.
3. William Stallings: Operating Systems, PHI.
4. Yashawant Kanetkar: Unix Shell Programming, BPB.
5. Behrouz A. Forouzan, Richard F. Gilberg: Unix and shell Programming, Thomson
6. A.S. Tanenbaum: Modern Operating Systems, Pearson/PHI.
7. Dhamdhere: Operating Systems, Tata McGraw Hill.
8. Robert Love: Linux System Programming, O'Reilly, SPD.
9. Jason Cannon: Linux For Beginners,
10. William Shotts: T he Linux Command Line : A Complete Introduction.
11. Daniel J. Barrett: Linux Pocket Guide : Essential Commands
12. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

20MCA22DA1: THEORY OF COMPUTATION

Course Outcomes:

By the end of the course the students will be able to:

CO1: Analyze and design finite automata, formal languages, and grammars.
CO2: Understand the basic concepts of DFA and NDFA.
CO3: Construct context free grammar for various languages.
CO4: Understand Turning Machine and recursive language.
CO5: Gain understanding about tractable and non-tractable problems.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Review of Mathematical Terms and Theory: Basic Mathematical Notations And Set Theory, Logic Functions And Relations, Language Definitions, Mathematical Inductions and Recursive Definitions.

Finite Automata: Introduction, Alphabets, Strings and Languages, Kleen-closure; Deterministic Finite Automata (DFA) and Nondeterministic Finite Automata (NFA) -Formal definition, simpler notations (state transition diagram, transition table), Regular and Non-Regular Languages, Equivalence of NDFA & DFA, NDFA to DFA conversion, DFA minimization using Myhill-Nerode Theorem, Applications of Finite Automata, Finite automata with output (Moore and Mealy machines) and inter-conversion.

UNIT-II

Context Free Grammar: Introduction to CFG, CFG and Known Languages, Unions Concatenations and *'S Notations and CFL, Derivations of Trees and Ambiguity, Unambiguous CFG and Algebraic Expressions, Normal Forms and Simplified Forms.

Formal Grammar: Definition, Chomsky hierarchy of grammars, Construction of Context free, derivation, parse tree, ambiguity in grammars, Removal of null and unit production, Normal forms- CNF & GNF.

Pushdown Automata: Introduction to PDA, Types of PDA, Designing of PDA, CFG Corresponding to PDA, Introduction to CFL, Intersections and Complements of CFL, Decisions Problems and CFL, Equivalence of Pushdown Automata and CFL, Pumping Lemma for CFL, Applications.

UNIT-III

Turing Machines: Model of Computation and Church Turning Thesis, Definition of Turing Machine, Tm and Language Acceptors, Variations of Tm, Non- Deterministic Tm, Universal Tm, Tm & computers.

Recursive Language: Introduction, Enumerable and Language, Recursive and Non Recursive Enumerable, their properties.

PCP: Introduction to undecidability, undecidable problems about TMs, Post correspondence problem (PCP), Modified PCP.

UNIT-IV

Computation Functions, Measuring, Classifications and Complexity: Primitive Recursive Functions, Halting Problem, Recursive Predicates and Some Bounded Operations, Unbounded Minimizations and μ-Recursive Functions, Godel Numbering, Computable Functions and μ-Recursive, Numerical Functions.

Tractable and Intractable Problems: Growth Rate and Functions, Time and Speed Complexity, Complexity Classes, Tractable and Possibly Intractable Problems, P And NP Completeness, Reduction Of Time, Cook's Theorem, NP-Complete Problems.

Suggested Readings:

1. John C. Martin: Introduction to Language and theory of Computation, Mcgraw Hill.
2. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman: Introduction to Automata Theory Languages and Computation, Pearson Education
3. K. L. P Mishra, N. Chandrashekaran: Theory of Computer Science-Automata Languages and Computation, Prentice Hall of India, India.
4. K.Krithivasan and R.Rama: Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
5. Harry R. Lewis and Christos H. Papadimitriou: Elements of the Theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd
6. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

20MCA22DA2: COMPUTER NETWORKS & DISTRIBUTED SYSTEMS

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand basic concepts data communication and computer networks.
CO2: Gain understanding about OSI model and TCP/IP.
CO3: Develop understanding about working of different layers of TCP/IP and OSI model.
CO4: Understand about concept Distributed Systems and Synchronization.
CO5: Learn about replication management, fault tolerance and security in Distributed Systems.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will

be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Data Communication: Introduction to data communication; analog and digital signals; asynchronous and synchronous transmission; data encoding and modulation techniques, broadband and base band transmission, multiplexing, transmission medium.

Network Classification: Wired Network, Wireless Network, Internetworking Devices.

Network Reference Models: Layered architectures, protocol hierarchies, interface and services: ISO- OSI reference model, TCP/IP reference model; internet protocol stacks.

UNIT-II

Data Link Layer Functions and Protocols: Framing, error-control, flow-control; sliding window protocol; HDLC, Error detection and correction, Data link layer of internet.

Medium Access Sub-layer: CSMA/CD protocol, IEEE standards for LAN and MAN, X.25, frame relay, Narrowband and Broadband ISDN, Asynchronous Transfer Modes.

Network Functions & Protocols: Switching mechanism and its various types, routing and congestion control, Internetworking-TCP/IP, IP Packet, IP address, IPv6

Transport Layer: Design issues, Connection management (UDP, TCP and their Frame Format); **Application Layer:** File Transfer, Access and Management, E-Mail, Virtual Terminal, Public Network.

UNIT-III

Introduction to Distributed Systems: Introduction, Design Goals, Types of Distributed systems, System Architecture and Fundamental models, Middleware, Threads, Virtualization, Client-server model, multiple servers, proxy servers and caches, peer processes, code migration.

Communication Fundamentals: Basic concepts, Remote Procedure Call, Message Oriented Communication, Stream Oriented Communication, Multicast Communication**.**

Synchronization: Clock synchronization, Logical clocks, Mutual exclusion algorithms: centralized, decentralized, distributed and token ring algorithms, election algorithms.

UNIT-IV

Replication Management: Need for replication, Consistency models, Consistency protocols, Replica management.

Fault Tolerance: Basic concepts and failure models, Process resilience, Reliable client-server and group communication, Distributed commit recovery mechanisms.

Security in Distributed Systems: Secure channels, Access control, Security management, Cryptographic algorithms; Digital signatures; certificates, firewalls.

Naming: Flat naming, Structured naming, Name space and Resolution, Attribute- based naming, Directory services, LDAP, Decentralized implementations.

Case Studies: Needham-Schroeder, Kerberos, SSL.

Suggested Readings:

1. A.S. Tanenbaum: Computer Networks, Prentice-Hall of India.

2. W. Tomasi: Introduction to Data Communications and Networking, Pearson Education.
3. P.C. Gupta: Data Communications and Computer Networks, Prentice-Hall of India.
4. Behrouz Forouzan and S.C. Fegan: Data Communications and Networking, McGraw Hill.
5. L. L. Peterson and B. S. Davie: Computer Networks: A Systems Approach, Morgan Kaufmann.
6. William Stallings: Data and Computer Communications, Pearson Education.
7. George Coulouris, Jean Dollimore, Tim Kindberg: Distributed Systems-Concepts and Design, Pearson Education
8. Andrew S. Tanenbaum, Marten Van Steen: Distributed Systems-Principles & Paradigms, Pearson Education.
9. A. D. Kshemkalyani and M. Singhal: Distributed Algorithms: Principles, Algorithms, and Systems.
10. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

20MCA22DA3: WEB TECHNOLOGIES

Course Outcomes:
By the end of the course the students will be able to:
CO1: Understand web concepts and Markup Languages.
CO2: Learn client-side and server-side programming.
CO3: Learn to represent web data and XML document handling.
CO4: Understand AJAX and relevance.
CO5: Learn about web services and their development.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Web Essentials: Clients, Servers, and Communication. Basic Internet Protocols, W3C, HTTP, Web Clients & Web Servers.

Markup languages-XHTML: Introduction to HTML, basics of XTHML, HTML elements, HTML tags, lists, tables, frames, forms, defining XHTML's abstract syntax, defining HTML documents.

CSS style sheets: Introduction, CSS core syntax, text properties, CSS box model, normal flow box layout, other properties like list, tables, DHTML, XML, XML documents & vocabulary, XML versions & declarations, Introduction to WML.

UNIT-II

Client-Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers.

Host Objects: Browsers and the Document Object Model (DOM), Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window.

Server-Side Programming: Concept of server-side programming, Java Servlets revistited-Architecture -Overview-A Servlet-Generating Dynamic Content-Life Cycle- Parameter Data-Sessions-Cookies-URL Rewriting-Other Capabilities-Data Storage Servlets and Concurrency- Databases and Java Servlets.

UNIT-III

Separating Programming and Presentation: JSP Technology revisited - JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm-Databases and JSP. Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces- DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers.

UNIT-IV

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods.

Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL- Representing Data Types: XML Schema-Communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files.

Suggested Readings:

1. Jackson: Web Technologies: A Computer Science Perspective, Pearson Education India.
2. Roger S Pressman, David Lowe: Web Engineering: A Practitioner's Approach, TMH.
3. Achyut Godbole,Atul Kahate: Web Technologies, McGraw-Hill Education.
4. Uttam K Roy: Web Technologies, Oxford University Press.
5. Chris Bates: Web Programming, Wiley.
6. Gertel Keppel, Birgit Proll, Siegfried Reich, Werner R.: Web Engineering, John Wiley& Sons Inc.
7. Berner's LEE, Godel and Turing: Thinking on the Web, John Wiley & Sons Inc.
8. Paul S.Wang Sanda S. Katila: An Introduction to Web Design Plus Programming, Thomson.
9. Robert W.Sebesta: Programming the World Wide Web, Third Edition, Pearson Education.
10. Thomas A.Powell: The Complete Reference HTML & XHTML, Fourth Edition, Tata McGraw Hill.
11. Abders Moller and Michael Schwartzbach: An Introduction to XML and Web Technologies, Addison Wesley.
12. Joel Sklar: Principles of Web Design, Thomson.
13. Joel Sklar: Web Design, Cengage Learning
14. Web Technologies: Black Book, Dreamtech Press

15. Raj Kamal: Internet and Web Technologies, Tata McGraw Hill.
16. Ralph Moseley and M. T. Savaliya: Developing Web Applications, Wiley-India.
17. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

20MCA22DB1: CLOUD COMPUTING

Course Outcomes:
By the end of the course the students will be able to:
CO1: Understand the various cloud computing service models.
CO2: To use various Cloud Services.
CO3: Perform service management in cloud computing.
CO4: Understand various security concepts in cloud computing.
CO5: Understand cloud functionality on the basis of various case-studies.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Cloud Computing Fundamentals: Definition of Cloud Computing: Defining a cloud, Evolution of Cloud Computing cloud types-NIST model, cloud cube model, Deployment models, Service models, Cloud Reference model, Characteristics of Cloud, Cloud Computing Benefits and Limitations, Cloud Architecture: Introduction on Infrastructure, platforms, virtual appliances, communication protocols; Cloud computing vs. Cluster computing vs. Grid computing; Applications: Technologies and Process required when deploying Web services; Deploying a web service from inside and Outside of a Cloud. Services and Applications by Types: IaaS, PaaS, SaaS, IDaaS, and CaaS.

UNIT II

Virtualization: Objectives, Benefits of Virtualization, Emulation, Virtualization for Enterprise, VMware, Server Virtualization, Data Storage Virtualization, Load balancing and Virtualization, Improving Performance through Load Balancing, Hypervisors, Machine Imaging, Porting of applications in the cloud. Concept of Software-Defined Networking (**SDN**), Network-Function Virtualization (**NFV**) and Virtual Network Functions (**VNF**).

Use of Platforms in Cloud Computing: Concepts of Platform as a Service, Use of PaaS application frameworks; Use of Google, Amazon and Microsoft Web Services. Cloud vendors and Service Management:Amazon cloud, AWS Overview, Installation of AWS, Google app engine, azure cloud, salesforce.

UNIT - III

Cloud Management: Features of Network management system, Monitoring of an entire cloud computing deployment stack, lifecycle management of cloud services(six stages of lifecycle)

Service Management in Cloud Computing: Service Oriented Architecture: concepts of message-based transactions, Protocol stack for an SOA architecture, Event driven SOA, Enterprise Service bus, Service Catalogs, Service Level Agreements (SLAs), Managing Data: Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud , Large Scale Data Processing.

UNIT - IV

Cloud Security Concepts: Cloud security challenges, Cloud security approaches: encryption, tokenization/ obfuscation, cloud security alliance standards, cloud security models and related patterns, Cloud security in mainstream vendor solutions, Mainstream Cloud security offerings: security assessment, secure Cloud architecture design, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Security Mapping, Identity Management.

Case Study on Open Source & Commercial Clouds: Eucalyptus, Microsoft Azure, Amazon EC2.

Suggested Readings:

1. Cloud Computing : A Practical Approach by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, The McGraw-Hill.
2. Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more. by Dr. Kris Jamsa.
3. Tim Mather, SubraKumaraswamy, ShahedLatif: Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O'ReillyMedia Inc.
4. Cloud Computing Bible, Barrie Sosinsky, Wiley-India.
5. Jason Venner,Pro: Hadoop,Apress.
6. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley.
7. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012.
8. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India.
9. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

20MCA22DB2: SOFTWARE ENGINEERING

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand basic concept of Software Engineering and the phases in a software project.

CO2: Comprehend fundamental concepts of requirements engineering and SRS document.

CO3: Know about software design process and design methodologies.

CO4: Learn various software testing level and software project management activities.

CO5: Learn software maintenance types and software configuration management activities.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Introduction: Software and its Characteristics, Evolving Role of Software, Software Product, Software Processes, Software Crisis, 'Software Engineering' Evolution, Principles of Software Engineering, Programming-in-the-small vs. Programming-in-the-large, Software Components, Software Engineering Processes.

Software Life Cycle (SLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models, Object Oriented Models and other latest Models.

Software Requirements: Functional and Non-Functional, User requirements, System requirements. Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management.

UNIT-II

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Flow Charts, Coupling and Cohesion Measures; **Design Strategies:** Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design, User Interface Design, Programming practices and Coding standards.

Software Testing: Introduction, Verification vs. Validation, Software Reliability, Levels of Testing, Structural Testing (White Box Testing), Functional Testing (Black Box Testing).

UNIT-III

Software Quality: Attributes, Software Quality Assurance – plans & activities; Software Documentation.

Software Project Management: Project Management activities, Project Estimation, Project planning, Project scheduling.

Software Risk Management: Reactive versus Proactive Risk Strategies, Risk management activities; Software Risks (Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation), Risks Monitoring and Management.

Software Measurement and Metrics: Process Metrics, Project metrics, Estimation – LOC, Halstead's Software Science, Function Point (FP), Cyclomatic Complexity Measures; Software Project Estimation Models- Empirical, Putnam, COCOMO I & II.

UNIT-IV

Software Maintenance: Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance; Software Re- Engineering, Reverse Engineering, Software Documentation.

Software Configuration Management: SCM Activities, Change Control Process, Software Version Control; Software Reuse, Software Evolution.

CASE Computer Aided Software Engineering (CASE), CASE Tools.

Suggested Readings:

1. Rogers Pressman: Software Engineering, TMH.
2. Gill, Nasib Singh: Software Engineering, Khanna Book Publishing Co.(P) Ltd, New Delhi
3. Jalote, Pankaj: An Integrated Approach to Software Engineering, Narosa Publications.
4. Chhillar Rajender Singh: Software Engineering: Testing, Faults, Metrics, Excel Books, New Delhi.
5. Ghezzi, Carlo: Fundaments of Software Engineering, PHI.
6. Fairley, R.E.: Software Engineering Concepts, McGraw-Hill.
7. Lewis, T.G.: Software Engineering, McGraw-Hill..
8. Shere: Software Engineering & Management, Prentice Hall.
9. Deutsch, Willis: Software Quality Engineering: A Total Technical and Management Approach, Prentice Hall.
10. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

20MCA22DB3: ADVANCE COMPUTER ARCHITECTURE & QUANTUM COMPUTING

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand the principles of computer architecture, parallel computers and performance aspects.

CO2: Understand the program flow mechanisms, interconnect architectures and memory hierarchy design.

CO3: Understand multiprocessor and multicomputer architectures.

CO4: Comprehend concept of quantum computing and its essence.

CO5: Understand quantum search algorithms and quantum computing applications.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT - I

Evolution of Computer Architecture: Introduction of computer architecture, Elements of Modern Computers, Evolution of Computer Architectures, Classification of parallel computers, System attributes to performance.

Program and Network Properties: Conditions of Parallelism - data and resource dependences, Bernstein's conditions, hardware and software parallelism. Program Flow Mechanisms - control flow versus data flow, data flow architecture, demand driven mechanisms, comparison of flow mechanisms.

UNIT – II

System Interconnect Architectures: Network properties and routing, Static connection Networks –Linear Array, Ring & Chordal Ring, Barrel Shifter, Fat Tree, Mesh & Torus, Systolic Arrays, Hypercubes; Dynamic connection Networks – Digital Buses, Switch modules, MINs, Omega-, Baseline-, Crossbar-Network.

Memory Hierarchy Design: Memory hierarchy, Inclusion, coherence & locality; memory capacity planning; Virtual Memory technology – Models, TLB, Paging and Segmentation; Cache Memory Organization - Cache basics & cache performance, cache addressing models & mapping, multilevel cache hierarchies, interleaved memory.

UNIT – III

Multiprocessor and Multicomputer Architectures: Multiprocessor System Interconnects – Hierarchical bus systems, Crossbar Switch and Multiport memory, Multistage and Combining networks; Symmetric shared memory architectures, distributed shared memory architectures, Cache coherence problem, Snoopy cache coherence protocol, directory-based protocols; Multicomputer Generations, Message passing mechanisms – message routing schemes, deadlock and virtual channels, flow control strategies, multicast routing algorithms.

UNIT – IV

Overview of Quantum Computing: Qubits, quantum gates, Hilbert spaces, Dirac's notation, Quantum Superposition and Entanglement, Classical computing vs. Quantum computing, Postulates of quantum mechanics, Quantum circuits, quantum parallelism, Quantum circuits, universal gates, Quantum Fourier transform, Shor's factoring algorithm, order finding and periodicity, Grover's quantum search algorithm, Quantum error correcting codes, Quantum cryptography, Applications of Quantum Computing.

Suggested Readings:

1. Kai Hwang & Naresh Jotwani: Advanced Computer Architecture; McGraw-Hill.
2. Kai Hwang: Advanced computer architecture; TMH.
3. D.Sima, T.Fountain, P.Kasuk: Advanced Computer Architecture-A Design space Approach, Addison Wesley.
4. M.J Flynn: Computer Architecture, Pipelined and Parallel Processor Design; Narosa Publishing.
5. D. A. Patterson and J. L. Hennessey: Computer organization and design, Morgan Kaufmann
6. J.P.Hayes: Computer Architecture and Organization, MGH.
7. Harvey G. Cragon: Memory System and Pipelined processors, Narosa Publication.
8. V.Rajaraman & C.S.R.Murthy: Parallel computer: Architecture & Programming, PHI.
9. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, MGH.
10. Kai Hwang and Zu: Scalable Parallel computing, MGH.
11. P. Kaye, R. Laflamme, and M. Mosca: An Introduction to Quantum Computing. Oxford.
12. M. A. Nielsen and I. L. Chuang: Quantum Computation and Quantum Information, Cambridge University Press.
13. N.David: Quantum Computer Science: An Introduction.
14. Riley Tipton Perry: Quantum Computing from the Ground Up, World Scientific Publishing Ltd.
15. Scott Aaronson: Quantum Computing since Democritus, Cambridge.
16. P. Kok, B. Lovett: Introduction to Optical Quantum Information Processing, Cambridge.
17. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA SECOND YEAR

21MCA23C1: DATA MINING & BIG DATA ANALYTICS

Course Outcomes:
By the end of the course the students will be able to:
CO1: Understand Data Mining Systems and Pattern Analysis.
CO2: Understand Classification and Clustering techniques.
CO3: Identify Big Data and relevance of Big Data Analytics.
CO4: Understand Map Reduce and its features.
CO5: Understand Hadoop and Hadoop Eco-System.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Data Mining Concepts: Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, Applications, Data Objects and Attribute types, Statistical description of data; Data Pre-processing – Cleaning, Integration, Reduction, Transformation and Discretization; Data Visualization, Data similarity and dissimilarity measures.

Frequent Pattern Analysis: Mining Frequent Patterns, Associations and Correlations; Mining Methods- Pattern Evaluation Method, Pattern Mining in Multilevel; Multi-Dimensional Space – Constraint Based Frequent Pattern Mining; Classification using Frequent Patterns.

UNIT-II

Classification and Clustering: Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection, Techniques to improve Classification Accuracy. Clustering Techniques: Cluster analysis, Partitioning Methods - Hierarchical Methods, Density Based Methods, Grid Based Methods; Evaluation of clustering, Clustering high dimensional data, Clustering with constraints, Outlier analysis-outlier detection methods.

WEKA Tool: Introduction to Datasets, WEKA sample Datasets, Data Mining Using WEKA tool.

UNIT-III

Overview of Big Data and Hadoop: Types of Digital Data, Overview of Big Data, Challenges of Big Data,Modern Data Analytic Tools, Big Data Analytics and Applications;Overview and History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Environment.

HDFS: Concepts of Hadoop Data File System, Design of HDFS, Command Line Interface, Hadoop file system interfaces, Data flow; Hadoop I/O: Compression and Serialization.

UNIT - IV

Map Reduce: Introduction, Map Reduce Features, How Map Reduce Works, Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats.

Hadoop Eco System: Pig - Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases. Hive: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase: HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL: Introduction.

Data Analytics with R: Introduction of R and Big R, Collaborative Filtering, Big Data Analytics with Big R.

Suggested Readings:

1. Jiawei Han & Micheline Kamber: Data Mining - Concepts & Techniques, Harcourt India PVT Ltd. (Morgan Kaufmann Publishers).
2. I.H. Whiffen: Data Mining, Practical Machine Learning tools & techniques with Java (Morgan Kanffmen)
3. A.K. Pujari: Data Mining Techniques, University Press.
4. Pieter Adriaans Dolf Zant inge: Data Mining, Addition Wesley.
5. David Hand, Heikki Mannila, and Padhraic Smyth: Principles of Data Mining, PHI Publication.
6. Michael Berthold, David J. Hand: Intelligent Data Analysis, Springer.
7. Tom White: Hadoop- The Definitive Guide, Third Edition, O'reilly Media.
8. Seema Acharya, Subhasini Chellappan: Big Data Analytics, Wiley.
9. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos: Understanding BigData: Analytics for Enterprise Class Hadoop and Streaming Data, Mc Graw Hill publishing.
10. Anand Rajaraman and Jeffrey David Ullman: Mining of Massive Datasets, Cambridge University Press.
11. Bill Franks: Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streamswith Advanced Analytics, John Wiley &Sons.
12. Glenn J. Myatt: Making Sense of Data, John Wiley & Sons.
13. Pete Warden: Big Data Glossary, O'Reilly.
14. Zikopoulos, Paul, Chris Eaton: Understanding Big Data- Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA23C2: ARTIFICIAL INTELLIGENCE & COMPUTATIONAL INTELLIGENCE

Course Outcomes:

By the end of the course the students will be able to:

CO1: Learn the concept of Artificial intelligence, problem solving and searching process.
CO2: Understand the concept of Expert system with its architecture and life cycle.
CO3: Understand the concepts of knowledge, Knowledge acquisition and various levels and schemes for knowledge representation.
CO4: Learn the concepts of computational intelligence evolutionary computation and neural networks.
CO5: Handle the uncertainty in knowledge using fuzzy logic and understand concepts of fuzzy logic.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Introduction to Artificial Intelligence: Definition, history and applications of AI; Problem solving: Definingthe problem as state space search, Production System, Problem characteristics; Search techniques: Brute Force and Heuristic Search.

Expert System: Definition, role of knowledge, architecture and life cycle of Expert System.

UNIT-II

Knowledge &Its Representation: Types of knowledge, Knowledge acquisition and its techniques, Knowledge engineering, Cognitive behavior; Knowledge representation: Level of representation; Knowledge representation schemes: Formal logic, Inference Engine, Semantic net, Frame, Scripts.

Perception: Sensing, Speech recognition, Vision, Action.

UNIT-III

Computational Intelligence: Introduction to Computational Intelligence, Biological and Artificial Neural **N**etwork (ANN), artificial neural network models; learning in artificial neural networks; neural network and its applications.

Evolutionary Computation: Fundamentals of evolutionary computation, Design and Analysis of Genetic Algorithms, Evolutionary Strategies, comparison of GA and traditional search methods. Genetic Operators and Parameters, Genetic Algorithms in Problem Solving; Optimization: Particle Swarm Optimization, Ant Colony Optimization, Artificial Immune Systems; Other Algorithms: Harmony Search, Honey-Bee Optimization, Memetic Algorithms, Co-Evolution, Multi-Objective Optimization, Tabu Search,Constraint Handling.

UNIT-IV

Fuzzy Systems: Crisp sets, Fuzzy sets: Basic types and concepts, characteristics and significance of paradigm shift, Representation of fuzzy sets, Operations, membership functions, Classical relations and fuzzy relations, fuzzyfication, defuzzyfication, fuzzy reasoning, fuzzy inference systems, fuzzy control system, fuzzy clustering, applications of fuzzy systems.Neuro-fuzzy systems, neuro-fuzzy modeling; neuro-fuzzy control.

Applications: Pattern Recognition, Image Processing, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing.

Suggested Readings:

1. Rich Elaine and Knight Kevin : Artificial Intelligence, Tata McGraw Hill .
2. M. Mitchell: An Introduction to Genetic Algorithms, Prentice-Hall.
3. J.S.R.Jang, C.T.Sun and E.Mizutani: Neuro-Fuzzy and Soft Computing, PHI, Pearson Education.
4. Timothy J.Ross: Fuzzy Logic with Engineering Applications, McGraw-Hill.
5. Davis E.Goldberg: Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley.
6. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA23C3: ANDROID MOBILE APPLICATION DEVELOPMENT

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand concepts of android application development process
CO2: Analyze algorithms for use in MVC model of development
CO3: Handle databases in Android applications.
CO4: Synthesize location and mapping related user interfaces in android applications.
CO5: Understand Playing and Recording of Audio and Video in application.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Introduction: Mobile Applications, Characteristics and Benefits, Application Model,

Infrastructure and Managing Resources, Mobile Software Engineering, Frameworks and Tools, Mobile devices Profiles.

Application Design: Memory Management, Design patterns for limited memory, Work flow for Application Development, Techniques for composing Applications, Dynamic Linking, Plug-ins and rules of thumb for using DLLs, Concurrency and Resource Management.

UNIT-II

Google Android: Introduction, JDK & ADK, Android Application Architecture, Traditional Programming Model and Android, Activities, Intents, Tasks, Services.

Android Framework: GUI and MVC Architecture, Fragments and Multi-platform development, Creating Widgets: Layouts, Shadows, Gradients; Applications with multiple screens.

Development: Intents and Services, Storing and Retrieving data, Graphics and Multimedia, Telephony, Location based services, Packaging and Deployment.

UNIT-III

Android Applications: Working with Android, Various life cycles for applications, Building an User Interface: Blank UI, Folding and Unfolding a scalable UI, Making Activity, Fragment, Multiple layouts; Content Provider, Location and Mapping: location based services, Mapping, Google Maps activity, Working with Map View and Map Activity; Sensors and Near Field Communication; Native libraries and headers, Building client server applications.

UNIT-IV

Using Google Maps, GPS and Wi-Fi Integration, Android Notification, Audio manager, Bluetooth; Camera and Sensor integration, Sending SMS, Phone Calls. Runtime Environment for Applications, Callbacks and Override in application, Concurrency, Serialization, Application Signing, API keys for Google Maps, Publishing Android Application; Introduction to Flutter, Android features, UI, implementation.

Suggested Readings:

1. Zigurd Mednieks, Laird Dornin, G, BlakeMeike and Masumi Nakamura: Programming Android, O'Reilly Publications.
2. Wei-Meng Lee: Beginning iPhone SDK Programming with Objective-C, Wiley India Ltd.
3. James C.S: Android Application development, CENGAGE Learning.
4. Gargenta M., Nakamura M.: Learning Android, O'Reilly Publications.
5. Reto Meier: Professional Android 2 Application Development, WROX Publication-Wiley-India.
6. James Edward: J2ME: The Complete Reference, James Edward – Publication.
7. Chris Haseman: Android Essentials, Apress Publication.
8. Mark L Murphy: Beginning Android - Wiley India Pvt Ltd.
9. Sayed Y Hashimi and Satya Komatineni: Pro Android – Wiley India Pvt Ltd.
10. Lauren Darcey, Shane Conder: Android Wireless Application Development, 2nd edition –Pearson Education.
11. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA23DA1: COMPUTER VISION

Course Outcomes:

By the end of the course the students will be able to:

CO1: Implement fundamental image processing techniques required for computer vision.
CO2: Perform shape analysis and implement boundary tracking techniques.
CO3: Apply Hough Transform for line, circle, and ellipse detections.
CO4: Apply 3D vision techniques and implement motion related techniques.
CO5: Develop applications using computer vision techniques.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT - I

Image Processing Foundations: Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.

Shapes and Regions: Binary shape analysis – connectedness – object labelling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

UNIT - II

Hough Transform: Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – Generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT - III

3D Vision and Motion: Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

UNIT - IV

Applications: Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces; Application: Surveillance – foreground-

background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis; Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

SuggestedReadings:

1. D. L. Baggio et al.: Mastering OpenCV with Practical Computer Vision Projects‖, Packt Publishing.
2. E. R. Davies: Computer & Machine Vision‖, Fourth Edition, Academic Press.
3. Jan Erik Solem: Programming Computer Vision with Python: Tools and algorithms for analyzing images, O'Reilly Media.
4. Mark Nixon and Alberto S. Aquado: Feature Extraction & Image Processing for Computer Vision‖, Third Edition, Academic Press.
5. R. Szeliski: Computer Vision: Algorithms and Applications‖, Springer.
6. Simon J. D. Prince: Computer Vision: Models, Learning, and Inference‖, Cambridge University Press.
7. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA23DA2: SOFTWARE TESTING & QUALITY ASSURANCE

Course Outcomes:

By the end of the course the students will be able to:

CO1: Knowledge of various Software Testing techniques.

CO2: Apply Software Testing Strategies and Metrics for Software testing.

CO3: Implement Object Oriented Testing strategies.

CO4: Use of Software Quality Assurance.

CO5: Implement Quality management standards and methods.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Testing Strategy and Environment: Minimizing Risks, Writing a Policy for Software Testing, Economics of Testing, Testing-an organizational issue, Management Support for Software Testing, Building a Structured Approach to Software Testing, Developing a Test Strategy Building Software Testing Process: Software Testing Guidelines, workbench concept, Customizing the Software Testing Process, Process Preparation checklist - Software

Testing Techniques: Dynamic Testing – Black Box testing techniques, White Box testing techniques, Static testing, Validation Activities, Regression testing.

UNIT-II

Software Testing Strategies: Approach, Issues; integration, incremental, System, alpha, Beta testing etc; Comparative evaluation of techniques: Testing tools; Dynamic analysis tools, test data generators, Debuggers, test drivers etc.

Technical Metrics for Software: Quality Factors, framework; Metrics for analysis, design, testing source code.

UNIT-III

Object Oriented Testing: Introduction to Object Oriented testing, Path Testing, State Based Testing, Class Testing, Testing Web Applications: Web testing, Functional Testing, User interface Testing, Usability Testing, Configuration and Compatibility Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing.

Rational Rose Software: Introduction, Features, Various types of software testing using Rational Rose.

UNIT-IV

Software Quality Assurance and Standards: Software Quality, Software QualityChallenges, Software Quality factors. Software Quality Assurance: concept, components, importance and essence; FTR, structured walk through technique etc. Software Quality Management Standards, Management and its role in Software Quality Assurance, Quality Standards: ISO 9000 and Companion ISO Standards, CMM, CMMI.

Suggested Readings:

1. Meyers, G.: The art of Software Testing, Wiley-Inter-Science.
2. Deutsch, Willis: Software Quality Engineering: A Total Technical and Management Approach, Prentice Hall.
3. Pressman : Software Engineering, TMH.
4. Gill, Nasib Singh: Software Engineering : Reliability, Testing and Quality Assurance, Khanna Book Publishing Co.(P) Ltd, N. Delhi
5. Ghazzi, Carlo: Fundaments of Software Engineering, PHI.
6. Chhillar Rajender Singh: Software Engineering: Testing, Faults, Metrics, Excel Books, New Delhi.
7. Jalote, Pankaj: An Integrated Approach to Software Engineering, Narosa Publications.
8. Doug Bell, Ian Murrey, John Pugh: Software Engineering-A Programming Approach, Prentice Hall.
9. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and good books may be added from time to time.

21MCA23DA3: MIXED REALITY & WEARABLE COMPUTING

Course Outcomes:

By the end of the course the students will be able to:

CO1: Knowledge of wearable computing

CO2: Understanding of various devices used in wearable computing

CO3: Understand the hardware and software requirements of wearable computing

CO4: Understand the cybernetics and humanistic intelligence

CO5: Knowledge of Internet of Everything

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Introduction: History, Creative Coding Platforms, Open Source Platforms, PIC, Arduino, Sketch, Raspberry Pi, Iterative coding methodology. Python Programming - Mobile phones and similar devices, Arm Devices, Basic Electronics (circuit theory, measurements, parts identification)

Sensors and Software: Understanding Processing Code Structure, variables and flow control, Interfacing to the Real World.

UNIT-II

Software &Hardware Frameworks: Software-Open Frameworks as our IDE (C/C++) - Arduino Language (C/C++), Hardware- Desktop / Laptop / Raspberry Pi - How to approach a programming problem? Representing "reality" with computers. Digital vs. Analog circuits, audio, communication, etc. Analog to Digital Conversion (ADC) - Digital to Analog Conversion (DAC)– Microcontrollers - Communication – Serial & Parallel - Hardware to Hardware Communication - I2C/IIC (Inter-Integrated Circuit) - SPI (Serial Peripheral Interface) – Serial UART Communication.

UNIT-III

Cybernetics and Humanistic Intelligence Wearables: Augmented Reality – Mixed Reality. AR versus VR - IoT and Wearables: Smart Cites and Wearable Computing as a form of urban design - Advanced I/O – open Frameworks: Live Network feeds (push and pull) - Data persistence (saving data and preferences) - Database interface (MySQL, SQLite, XML, PHP/Web) - Arduino: Wired/Wireless Networking (hardware vs. USB proxy) - Software serial (RS-232).

UNIT-IV

Internet of Everything: Humanistic Intelligence; Wearable Computing and IoT (Internet of Things), Overview of Mobile and Wearable Computing, Augmented Reality, and Internet of Things. The fundamental axes of the Wearables + IoT + AR space - Free-roaming AR:

Wearable Computing, Wireless, Sensing, and Meta sensing with light bulbs Phenomenal Augmented Reality: Real world physical phenomena as the fundamental basis of mobile and wearable AR.

Suggested Readings :

1. Woodrow Barfield : Fundamentals of Wearable Computers and Augmented Reality, Second Edition.
2. Omesh Tickoo, Ravi Iyer : Making Sense of Sensors: End-to-End Algorithms and Infrastructure Design.
3. Josha Noble : Programming Interactivity, Second Edition.
4. Raspberry Pi: Getting Started with Python, second edition, 2016
5. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and good books may be added from time to time.

21MCA23DB1: NETWORK PROGRAMMING

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand TCP/IP and Network Architecture.
CO2: Creating sockets and socket implementation.
CO3: Windows Socket API and their programming.
CO4: Web programming and implementing security.
CO5: Performing client side programming and server side programming.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT- I

Introduction: Overview of UNIX OS, Environment of a UNIX process, Process control, Process relationships Signals, Interprocess Communication, Overview of TCP/IP, Network architecture, UUCP, XNS, IPX/SPX for LANs, TCP & IP headers, IPv4 & v6 address structures.

Socket Programming: Creating sockets, Posix data type, Socket addresses, Assigning address to a socket, Java socket programming, Thread programming, Berkeley Sockets: Overview, socket address structures, byte manipulation & address conversion functions, elementary socket system calls – socket, connect, bind, listen, accept, fork, exec, close, TCP ports (ephemeral, reserved), Berkeley Sockets: I/O asynchronous & multiplexing models,

select & poll functions, signal & fcntl functions, socket implementation (client & server programs), UNIX domain protocols.

UNIT- II

APIs & Winsock Programming: Windows socket API, window socket & blocking I/O model, blocking sockets, blocking functions, timeouts for blocking I/O, API overview, Different APIs & their programming technique, DLL & new API's, DLL issues, Java Beans.

UNIT- III

Web Programming & Security: Java network programming, packages, RMI, Overview of Javascript, WAP architecture & WAP services, Web databases, Component technology, CORBA concept, CORBA architecture, CGI programming, Firewall & security technique, Cryptography, Digital Signature.

UNIT- IV

Client Server Programming: Client side programming:- Creating sockets, implementing generic network client, Parsing data using string Tokenizer, Retrieving file from an HTTP server, Retrieving web documents by using the URL class. Server side programming:- Steps for creating server, Accepting connection from browsers, creating an HTTP server, Adding multithreading to an HTTP server.

SuggestedReadings:

1. W.Richard Stevens: Advanced Programming in the UNIX Environment, Addison Wesley.
2. W. Stevens, Bill Fenner, Andrew Rudoff: UNIX Network Programming -Volume 1 (The Sockets Networking API), Pearson Education/Prentice-Hall International.
3. Meeta Gandhi,Tilak Shetty and Rajiv Shah: The 'C' Odyssey Unix –The open Boundless C, BPB Publications.
4. Steven.W.R: UNIX Network Programming (Volume I& II), PHI.
5. Bobb Quinn and Dave Schutes: Window Socket Programming by
6. Davis.R.: Windows Network Programming, Addison Wesley.
7. Baner .P.: Network Programming With Windows Socket, Prentice Hall.
8. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA23DB2: NATURAL LANGUAGE PROCESSING & SPEECH RECOGNITION

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand Natural Language Processing, Probabilistic model of defining language and techniques.

CO2: Applying Hidden Markov model and Speech Recognition.

CO3: Application of context free grammar and language parsing.

CO4: Implement probabilistic and language parsing.

CO5: Differentiation of semantic and discourse in terms of NLP.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT - I

Introduction to Natural Language Processing: NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity.

Regular Expressions: Regular Expressions, Automata, Similarity Computation: Regular Expressions, patterns, FA, Formal Language, NFSA, Regular Language and FSAs, Raw Text Extraction and Tokenization, Extracting Terms from Tokens, Vector Space Representation and Normalization, Similarity Computation in Text.

Morphology and Finite-State Transducers: Inflection, Derivational Morphology, Finite-State Morphological Parsing, The Lexicon and Morphotactics, Morphological Parsing with Finite State Transducers, Combining FST Lexicon and Rules, Lexicon-free FSTs: The Porter Stemmer, Human Morphological Processing.

UNIT - II

Matrix Factorization and Topic Modeling: Introduction, Singular Value Decomposition, Nonnegative Matrix Factorization, Probabilistic Latent Semantic Analysis, Latent Dirichlet Allocation

Computational Phonology and Text-to-Speech: Speech Sounds and Phonetic Transcription, The Phoneme and Phonological Rules, Phonological Rules and Transducers, Advanced Issues in Computational Phonology, Machine Learning of Phonological Rules, Mapping Text to Phones for TTS, Prosody in TTS .

Probabilistic Models of Pronunciation and Spelling: Dealing with Spelling Errors, Spelling Error Patterns, Detecting NonWord Errors, Probabilistic Models, Applying the Bayesian method to spelling, Minimum Edit Distance, English Pronunciation Variation, The Bayesian method, Pronunciation in Humans.

N-gram Language Models: The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models. Smoothing, Backoff, Deleted Interpolation, N-grams for Spelling and Pronunciation, Entropy.

UNIT - III

HMMs and Speech Recognition: Speech Recognition Architecture, Overview of Hidden Markov Models, The Viterbi Algorithm Revisited, Advanced Methods for Decoding, Acoustic Processing of Speech, Computing Acoustic Probabilities, Training a Speech Recognizer, Waveform Generation for Speech Synthesis, Human Speech Recognition.

Word Classes and Part-of-Speech Tagging: Tagsets for English, Part of Speech Tagging, Rule-based Part-of-speech Tagging, Stochastic Part-of-speech Tagging, Transformation-Based Taggin.

Context-Free Grammars for English: Context-Free Rules and Trees, Sentence-Level Constructions, The Noun Phrase, Coordination, Agreement and The Verb Phrase and Sub-

categorization, Auxiliaries, Spoken Language Syntax, Grammar Equivalence & Normal Form, Finite State & Context-Free Grammars, Grammars & Human Processing.

UNIT - IV

Parsing with Context-Free Grammars and Features and Unification: Parsing as Search, A Basic Top-down Parser, The Earley Algorithm, Finite-State Parsing Methods, Feature Structures, Unification of Feature Structures, Features Structures in the Grammar, Implementing Unification, Parsing with Unification Constraints, Types and Inheritance

Lexicalized and Probabilistic Parsing: Probabilistic Context-Free Grammars, Problems with PCFGs, Probabilistic Lexicalized CFGs, Dependency Grammars, Human Parsing, The Chomsky Hierarchy, How to tell if a language isn't regular, Natural Language Context-Free or not, Complexity and Human Processing.

Representing Meaning and Semantic Analysis: Computational Desiderata for Representations, Meaning Structure of Language, First Order Predicate Calculus, Some Linguistically Relevant Concepts, Alternative Approaches to Meaning, Syntax-Driven Semantic Analysis, Attachments for a Fragment of English, Integrating Semantic Analysis into the Earley Parser, Idioms and Compositionality, Robust Semantic Analysis

Text Sequence Modeling and Deep Learning: Statistical Language Models, Kernel Methods, Word-Context Matrix Factorization Models, Neural Language Models, Recurrent Neural Networks.

Suggested Readings:

1. Daniel Jurafsky and James H.Martin: Speech and Language Processing(2nd Edition),Prentice Hall:2 edition,2008.
2. Charu C.Aggarwal: Machine Learning for Text Springer,2018 edition
3. Christopher D.Manning and Hinrich Schuetze: Foundations of Statistical Natural Language Processing MIT press.
4. Steven Bird,Ewan Klein and Edward Loper: Natural Language Processing with Python,O'Reilly Media.
5. Roland R.Hausser: Foundations of Computational Linguistics:HumanComputer Communication in Natural Language,Paperback,MIT press..
6. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA23DB3: BIOINFORMATICS COMPUTING

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand bioinformatics computing and the need for Bioinformatics technologies.
CO2: Exposed to biomedical data analysis.
CO3: Be familiar with the modelling techniques.
CO4: Exposed to Pattern Matching and Visualization.
CO5: Learn microarray analysis.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV.

Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT – I

Introduction: Bioinformatics computing, Bioinformatics technologies, Structural bioinformatics, Data format and processing, Secondary resources and applications, Role of Structural bioinformatics, Biological Data Integration System.

Data Warehousing and Mining in Bioinformatics: Bioinformatics data, Data warehousing architecture, data quality, Biomedical data analysis, DNA data analysis, Protein data analysis, Machine learning, Neural network architecture and applications in bioinformatics.

UNIT – II

Modelling for Bioinformatics: Hidden Markov modelling for biological data analysis, Sequence identification, Sequence classification, Multiple alignment generation, Comparative modelling, Protein modelling, Genomic modelling, Probabilistic modelling, Bayesian networks, Boolean networks, Molecular modelling, Computer programs for molecular modelling.

UNIT – III

Pattern Matching and Visualization: Gene regulation, motif recognition, motif detection, strategies for motif detection; Visualization – Fractal analysis, DNA walk models – one dimension, two dimension, higher dimension; Game representation of Biological sequences – DNA, Protein, Amino acid sequences.

UNIT – IV

Microarray Analysis: Microarray technology for genome expression study, image analysis for data extraction, pre-processing, segmentation, gridding, spot extraction, normalization, filtering, cluster analysis, gene network analysis; Compared Evaluation of Scientific Data Management Systems – Cost Matrix – Evaluation model - Benchmark – Tradeoffs.

Suggested Readings:

1. Yi-Ping Phoebe Chen (Ed): BioInformatics Technologies, Springer Verlag.
2. Bryan Bergeron: Bio Informatics Computing, Pearson Education.
3. Arthur M Lesk: Introduction to Bioinformatics, Oxford University Press
4. Stanley I. Letovsky: Bioinformatics: Databases and Systems.
5. SorinDraghici: Bioinformatics Databases- Design, Implementation, and Usage, Chapman & Hall/ CRC Mathematical Biology & Medicine.
6. Arthur M.Lesk: Database Annotation in Molecular Biology- Principles and Practices.
7. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA24C1: ADVANCE SOFTWARE ENGINEERING

Course Outcomes:

By the end of the course the students will be able to:

CO1: Learn about the emerging software engineering practices and their suitability.

CO2: Understand the concept of cleanroom software development and engineering web applications

CO3: Acquire understanding about agile software development and significance.

CO4: Understand the concept of scrum and agile requirements.

CO5: Learn about DevOps and its relevance in current scenario.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Emerging Software Engineering Practices: Aspect Oriented Software Development, Agile Methods, Security Engineering, Client/Server Software Engineering, Software Engineering Aspects of Programming Languages. **Cleanroom Software Engineering:** Approach, functional specification, design and testing.

Component-Based Software Engineering: Software Component and its Elements, Component Models - Concepts and Principles, COTS Myths, CBSE process, domain engineering, component-based development, classifying and retrieving components, and economics of CBSE.

Engineering Web Applications: Web-based applications and their attributes, Web Engineering process, framework for Web Engineering, formulating, analysing web-based systems, design and testing for web-based applications.

UNIT-II

Agile Software Development: Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges.

Agile and Scrum Principles: Agile Manifesto, Twelve Practices of Extreme Programming (XP), Scrum Practices, Applying Scrum. Need of scrum, working of scrum, advanced Scrum Applications, Scrum and the Organization, scrum values.

Agile Requirements: User Stories, Backlog Management. **Agile Architecture:** Feature Driven Development. **Agile Risk Management:** Risk and Quality Assurance, Agile Tools.

Agile Testing: Agile Testing Techniques, Test-Driven Development, User Acceptance Test.

UNIT-III

Agile Management: Agile Metrics and Measurements, Agile approach to estimating and project variables, Agile Measurement. **Agile Control:** the 7 control parameters. Agile

approach to Risk, Agile approach to Configuration Management, Atern Principles, Atern Philosophy, Rationale for using Atern, Refactoring, Continuous integration, Automated Build Tools.

Scaling Agile for Large Projects: Scrum of Scrums, Team collaborations, Scrum, Estimate a Scrum Project, Track Scrum Projects, Communication in Scrum Projects, Best Practices to Manage Scrum.

UNIT-IV

DevOps: History of DevOps, DevOps vs Agile, Advantages and Disadvantages of DevOps, DevOps Stakeholders, Architecture, Components and features of DevOps, SDLC models of DevOps, Workflow and Principles of DevOps, DevOps tools, DevOps automation and automation tools, Pipeline and Methodology , Azure DevOps, AWS DevOps.

Laboratory Work: Exploring the tools related to Agile Development and DevOps, and developing small projects using this technology.

Suggested Readings:

1. Roger S. Pressman: Software Engineering a Practitioners Approach, McGraw-Hill, Latest Edition.
2. Robert C. Martin: Agile Software Development, Principles, Patterns, and Practices Alan Apt Series.
3. Cohen Mike: Succeeding with Agile : Software Development Using Scrum, Pearson.
4. Software Engineering for Embedded Systems: Methods, Practical Techniques, and Applications, Robert Oshana, Mark Kraeling, Newnes Publisher.
5. Kristin Runyan: Introduction to Agile Methods Sondra Ashmore, Addison-Wesley.
6. Pekka Abrahams, OutiSalo, Jussi Ronkainen and Juhani Warsta: Agile Software Development Methods: Review and Analysis.
7. Jim Highsmith, Agile Project Management: Creating Innovative Products, Second Edition, Addison-Wesley Professional.
8. James A. Crowder, Agile Project Management: Managing for Success, Shelli Friess, Springer.
9. Andrew Stellman, Jennifer Greene, Learning Agile: Understanding Scrum, XP, Lean, and Kanban, O Reilly
10. Sricharan Vadapalli, DevOps: Continuous Delivery, Integration, and Deployment with DevOp, Packt.
11. Janet Gregory, Lisa Crispin, More Agile Testing: Learning Journeys for the Whole Team, Addison Wesley.
12. http://agilemanifesto.org/
13. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA24C2: IoT & SENSOR NETWORKS

Course Outcomes:

By the end of the course the students will be able to:

CO1: To understand the concepts of IoT and its applications.

CO2: Describe the OSI Model for the IoT/M2M Systems.

CO3: Understand the architecture and design principles for IoT.

CO4: Learn the programming for IoT Applications.

CO5: Identify the communication protocols which best suits the WSNs.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

IoT Overview: Introduction to Internet of Things, IoT Applications, IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M communication, Examples of IoT. Modified OSI Model for the IoT/M2M Systems, data enrichment, data consolidation and device management at IoT/M2M Gateway, web communication protocols used by connected IoT/M2M devices, Message communication protocols (CoAP-SMS, CoAPMQ, MQTT,XMPP) for IoT/M2M devices.

Architecture and Design Principles for IoT: Internet connectivity, Internet-based communication,IPv4, IPv6,6LoWPAN protocol, IP Addressing in the IoT, Application layer protocols: HTTP, HTTPS,FTP,TELNET and ports.

UNIT-II

Data Collection, Storage and Computing using a Cloud Platform: Introduction, Cloud computing paradigm for data collection, storage and computing, Cloud service models, IoT Cloud- based data collection, storage and computing services using Nimbits.

Prototyping and Designing Software for IoT Applications: Introduction, Prototyping Embedded device software, Programming Embedded Device Arduino Platform using IDE, Reading data from sensors and devices, Devices, Gateways, Internet and Web/Cloud services software development.

Programming MQTT clients and MQTT server.

IoT Security: Introduction to IoT privacy and security, Vulnerabilities, Security requirements and threat analysis, IoT Security Tomography and layered attacker model.

UNIT-III

Wireless Sensor Networks: Overview of WSNs, Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks.

Architectures: Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture-Sensor Network Scenarios, Optimization Goals and Figures of Merit, Design principles for WSNs, Service interfaces of WSNs, Gateway Concepts.

UNIT-IV

Communication Protocols: Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Contention based protocols (CSMA,PAMAS), Schedule based protocols (LEACH, SMACS, TRAMA) Address and Name Management in WSNs, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing, Hierarchical Networks by Clustering.

Suggested Readings:

1. Raj Kamal: Internet of Things-Architecture and design principles, McGraw Hill Education.
2. Holger Karl & Andreas Willig: Protocols And Architectures for Wireless Sensor Networks , John Wiley.
3. Feng Zhao & Leonidas J. Guibas: Wireless Sensor Networks- An Information Processing Approach, Elsevier.
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati: Wireless Sensor NetworksTechnology, Protocols, And Applications, John Wiley.
5. Anna Hac, Wireless Sensor Network Designs, John Wiley.
6. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle: From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Academic Press.
7. Peter Waher, Learning Internet of Things, PACKT publishing, BIRMINGHAM – MUMBAI
8. Bernd Scholz-Reiter, Florian Michahelles: Architecting the Internet of Things, Springer.
9. Daniel Minoli: Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Willy Publications
10. C.S Raghavendra, Krishna M.Sivalingam, Taiebznati: Wireless Sensor Networks, Springer Science.
11. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA24C3: WEB DEVELOPMENT USING .NET FRAMEWORK

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand Web development and Visual Studio environment.

CO2: Understand important concepts of .NET Framework and Deployment.

CO3: Design, Develop and Create Applications with C#.

CO4: Develop, implement, and demonstrate Component Services, Threading, Remoting, Windows services.

CO5: Access Database using ADO.NET and use ASP.NET for Application Development and Secure Web Services.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Overview of Web Development: Introduction, .NET Overview, Assemblies (monolithic vs. component-based applications), Execution Model, Client-Side vs. Server-Side Programming, Web Technologies, Development Environment Setup, IIS, SQL Server and Visual Studio.
Introduction to .NET Framework: Microsoft .NET Platform, Design, Goals and Overview, .NET Architecture, Console, Environment, IL, JIT, .NET framework Class library (System, Collections, I/O, Networking, Threading, Transactions, Exceptions), Common Language Runtime, CLR Execution, Common Type System, Common Language Specification, Managed and Unmanaged code.

C# Programming: Introduction to C#, program structure; Variables and Data types: Initialization of Variables, Variable Scope, Constants, Value Types and Reference Types, CTS Types. Operators. Conditional Statements, Loops. Arrays. Strings. S**tructures:** Defining Structs, Creating Structs, Creating Enums

UNIT-II

Object Oriented Programming -Objects and Classes, Methods and Properties, Constructors and Destructors. **Inheritance**: Introduction**,** Types of Inheritance**,** Implementation versus Interface Inheritance, Multiple Inheritance.

Polymorphism: Abstract Classes Implementing Polymorphism by Method Overloading & Method Overriding.

Interfaces: Defining and Implementing Interfaces, Derived Interfaces, Accessing Interfaces, Overriding Interfaces.

Exception Handling: Exception Classes, Standard Exceptions, User Defined Exceptions. **Delegates, Events and Attributes.**

UNIT-III

Building Windows Based Applications: Standard Controls - Components, Forms, Menus and Dialogues, Validating user inputs.

Databases and Data Access Using ADO.NET: Overview of ADO.NET, Accessing Data, Using Dataset Objects and Updating Data Binding, Viewing, and Filtering Data, Connecting with the Database.

UNIT-IV

ASP.NET: Introduction to ASP.NET, Configuring ASP.NET Applications, Programming Model.

ASP.NET Frameworks-Code Behind, Page Directives, Page Events, Post Back.

ASP.NET Controls: Basic Web Server Controls, Data List Web Server Controls**,** Web Server Controls: Calendar Control, Ad rotator Control, Validation Controls, Grid View Controls. **Performing Data Access:** Data bound Controls, List Controls, Tabular & Hierarchical Data bound Controls, Data source Controls.

State Management, Web Services: View State, Session, Cookies, Application, Hidden Field; Authentication & Authorization; Developing Secure Web Services.

Suggested Readings:

1. Jeffrey Richter, Francesco Balena: Applied .Net Framework Programming in MS VB.Net, TMH Publication.
2. Herbert Schildt: Complete Reference C#, TMH Publication.
3. Michael Halvorsan: Microsoft Visual Basic.NET step by step, PHI Publication.
4. G.Andew Duthie: Microsoft ASP.Net With C#.Net step by step, PHI Publication.
5. Daniel Geron: Programming for Beginners: This Book Includes: SQL, C++, C#, Arduino Programming, Daniel Geron.
6. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

21MCA24DA1: CYBER SECURITY & BLOCKCHAIN TECHNOLOGY

Course Outcomes:

By the end of the course the students will be able to:

CO1: Become familiar with the concepts of cyber threats, cyber crime, cyber security and understand the vulnerability scanning.
CO2: Understand network defence tools and web application tools.
CO3: To learn about cyber crime, hacking attacks and cyber laws.
CO4: Understand the concepts of blockchain technology & its need and cryptocurrency.
CO5: Comprehend the applications of blockchain technology.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT - I

Introduction to Cyber Security: Overview of Cyber Security, Internet Governance – Challenges and Constraints; Cyber Threats: Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage; Need for a Comprehensive Cyber Security Policy.

Introduction to Vulnerability Scanning: Overview of vulnerability scanning, Open Port/Service Identification, Banner/Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit.

Network 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; Network Address Translation (NAT) and Port Forwarding; Basics of Virtual Private Networks, Linux Firewall, Windows Firewall.

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, L0htcrack, Pwdump, HTCHydra.

UNIT - III

Cyber Crimes and Law: Introduction to Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Digital Forensics, Realms of the Cyber world, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.

Cyber Crime Investigation: Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks.

UNIT - IV

Blockchain Technology: Cryptography - Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof; **Blockchain Overview:** Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.

Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin.

Blockchain Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

Suggested Readings:

1. Mike Shema: Anti-Hacker Tool Kit, McGraw Hill
2. Nina Godbole and Sunit Belpure: Cyber Security Understanding Cyber Crimes, ComputerForensics and Legal Perspectives, Wiley.
3. Achyut S.Godbole: Data Communication and Networking, McGraw –Hill Education New Delhi.
4. Forouzan: Data Communication and Networking (Global Edition) 5/e, McGraw Hill Education India.

5. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder: Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press.
6. Wattenhofer: The Science of the Blockchain.
7. Antonopoulos: Mastering Bitcoin - Unlocking Digital Cryptocurrencies.
8. Satoshi Nakamoto: Bitcoin: A Peer-to-Peer Electronic Cash System
9. Forouzan, B.A.: Cryptography & Network Security. Tata McGraw-Hill Education.
10. Kahate, A. Cryptography and Network Security. McGraw-Hill Higher Ed.
11. Peter Szor , The Art of Computer Virus Research and Defense, Symantec Press.
12. Markus Jakobsson and Zulfikar Ramzan, Crimeware, Understanding New Attacks and Defenses, Symantec Press, 2008, ISBN: 978-0-321-50195-0.
13. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.
14. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', CSI Publishing Platform, 2017.
15. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

21MCA24DA2: EDGE AND FOG COMPUTING

Course Outcomes:

By the end of the course the students will be able to:

CO1: Become familiar with the concepts of Fog Computing and its characteristics.

CO2: Understand Fog computing services, its components and Fog protocols.

CO3: Understand privacy-preserving computation in Fog computing.

CO4: Comprehend self-aware fog computing and cyber physical systems.

CO5: Understand leveraging fog computing in Healthcare IoT and other important Case Studies.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT - I

Evolution of Edge and Fog Computing: Introduction to Edge Computing, Cloud Computing analytics pipeline, Cloud databases, Coordination of Cloud Services, Geo-Distributed Computing, Edge Architectures, Edge Computing Applications. Concept of Fog Computing, Background and Motivation, Definition, Pros and Cons, Myths of Fog Computing, Characteristics, Issues, Application Scenarios, Fog Computing Services, Fog

Computing Components; Fog Computing vs Edge Computing vs Cloud Computing, Fog Resource Estimation and its challenges, Software architecture.

UNIT - II

Fog Protocols: Fog Protocol, Fog Kit, Proximity Detection Protocols- DDS/RTPS computing protocols

Fog Computing in Support of Hierarchical Emergent Behaviors: Introduction – Fog Computing – Hierarchical Emergent Behaviors, A Fresh Approach for ULSS - Two Autonomous Vehicles Primitives Case Study.

Privacy-Preserving Computation in Fog Computing: Introduction, Block Chain, Multi-Party Computation, Multi-Party Computation and Block Chain.

UNIT - III

Self-aware Fog Computing in Private and Secure Sphere: Cloud, Fog and Mist Computing Networks, Self-aware Data Processing.

Urban IoT Edge Analytics: Design challenges, Edge-assisted Architecture, Information Acquisition and Compression, Content-aware wireless networking, Information availability.

Cyber-Physical Energy Systems over Fog Computing: Power Grid and Energy Management, Energy Management Methodologies, Cyber-Physical Energy Systems, Internet-of-Things and Fog Computing, Control-as-a-Service, Residential Cyber-Physical Energy System.

UNIT - IV

Leveraging Fog Computing for Healthcare IoT: Introduction: Healthcare Services in the Fog Layer, Data management, Event Management, Resource Efficiency, Device management, Personalization, Privacy and Security, System Architecture of Healthcare IoT.

Case Studies: Wind Farm - Smart Traffic Light System, Wearable Sensing Devices, Wearable Event Device, Wearable System, Demonstrations, Post Application Example, Event Applications Example, Health monitoring – Patient Safety monitoring and training support – Smart house.

Suggested Readings:

1. Amir M. Rahmani ,PasiLiljeberg, Preden, Axel Jantsch: Fog Computing in the Internet of Things - Intelligence at the Edge‖, Springer International Publishing, 2018.
2. Amir Vahid Dastjerdi and Rajkumar Buyya: Fog Computing: Helping the Internet of Things Realize its Potential‖, University of Melbourne.
3. Zaigham Mahmood*:* Fog Computing: Concepts, Frameworks and Technologies, Kindle Edition.
4. Rahmani, A., Liljeberg, P., Preden, J.-S., Jantsch, A. (Eds.): Fog Computing in the Internet of Things - Intelligence at the Edge.
5. Assad Abbas, Samee U. Khan, Albert Y. Zomaya: Fog Computing – Theory and Practice, John Wiley & Sons, 2020.
6. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

21MCA24DA3: HIGH SPEED NETWORKS

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand high-speed networks and their relevance.

CO2: Learn about network performance evaluation and their analysis.

CO3: Understand ATM traffic management and integrated services.

CO4: Learn about protocols for QoS.

CO5: Understand Internet routing and analysis.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT - I

Frame Relay Network: Introduction, Packet-Switching Networks, Frame Relay Networks; **Asynchronous Transfer Mode:** ATM Protocol Architecture and Logical Connection, ATM Cells, ATM Service Categories, ATM Adaption Layer; **High Speed LANs:** Fast Ethernet LAN, Gigabit Ethernet, ATM LAN, Network Attached Storage (NAS), Wireless LAN and Wi-Fi, LAN Interoperability.

UNIT - II

Network Performance Evaluation Models: Introduction, Overview of Probability and Stochastic Processes, Queuing Analysis, Self-Similarity Network Traffic.

Congestion Management: Congestion – An Overview, Effects of Congestion, Congestion Control, Traffic Management, Frame Relay Congestion Control, Flow Control Techniques, Error Control Techniques; TCP Traffic and Congestion Control: TCP Flow control, TCP Congestion Control, Performance of TCP over ATM.

UNIT - III

ATM Traffic and Congestion Control: ATM Traffic and Congestion Control, Traffic Management Framework, ABR Traffic Management, GFR Traffic Management; **Integrated Services:** Integrated Service (IntServ) Model, Flow and Service Description, Queuing Discipline, Integrated Services in IP-ATM Networks; **Differentiated Services:** Differentiated Service Architecture, Scalability of DiffServ, DiffServ Functional Elements, Per-Hop Behavior (PHB), Models of DiffServ.

UNIT - IV

Protocols for Quality of Service (QoS) Support: Multicasting, Multicast Transport Protocol (MTP), Resource Reservation Protocol (RSVP), Real-Time Transport Protocol (RTP), Multiprotocol Label Switching (MPLS), Subnet Bandwidth Management (SBM), QoS Architectures, QoS Support for Multicast; **Internet Routing Basics and Design:** Basics of Graph Theory, Internet Routing Principles, Analysis of Shortest Route, Intra-Domain Routing Protocol, Border Gateway Protocol, Inter-Domain Routing Protocol (IDRP).

Suggested Readings:

1. Kaven Pahlavan and Prashant Krishnamoorthy: Principles of Wireless Network, Prentice Hall of India.
2. Adrian Farrel: The Internet And Its Protocols, Elsevier Publications.
3. Larry L. Peterson and Bruce S.Davie: Computer Networks, Elsevier Publications.
4. William Stallings: High-Speed Networks and Internets, Performance and Quality of Service, Pearson Publications.
5. Behrouz A. Forouzan: Data Communications and Networking, Fourth Edition, McGraw Hill.
6. B Muthukumaran: Introduction to High Performance Networks, Mcgraw-Hill
7. Douglas E. Comer: Internetworking with TCP/IP Volume – I, Principles, Protocols, and Architectures, Fourth Edition, Pearson Education.
8. Mahbub Hassan, Raj Jain: High Performance TCP/IP Networking, Concepts, Issues, and Solutions, Pearson Education.
9. Andrew S. Tanenbaum: Computer Networks, PHI.
10. James F. Kurose, Keith W. Ross: Computer Networking, A Top-Down Approach Featuring the Internet, Pearson Education.
11. Any other book(s)covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA24DB1: MACHINE LEARNING & PYTHON PROGRAMMING

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand the basic concept of Machine learning.

CO2: Understand supervised, unsupervised and reinforcement learning.

CO3: Familiar with Python environment, data types, operators used in Python.

CO4: Compare and contrast Python with other programming languages and Learn the use of control structures and functions in Python.

CO5: To understand the concepts of modules, packages, 2D & 3D visualization, database and concepts relating machine learning using Python

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Machine Learning: Introduction, various learning paradigms, perspective and issues, Version spaces, finite and infinite hypothesis spaces, PAC learning, Learning versus Designing, Training versus Testing, Predictive and descriptive tasks.

Supervised Learning: Decision trees- ID3, classification and regression trees; Regression-linear regression, Multiple linear regression, logistic Regression; Support Vector Machines-linear and non-linear, kernel functions, K-nearest neighbors.

UNIT - II

Ensemble Learning: Model combination Schemes, Voting, Error-correcting output codes; Bagging: Random Forest Trees; Boosting: Adaboost, Stacking.

Unsupervised Learning: Introduction to Clustering, Hierarchical: AGNES, DIANA; Partitional: K-means clustering, K-mode clustering, Expectation Maximization, Dimensionality Reduction, Feature Selection, PCA, factor analysis, manifold learning.

Reinforcement Learning: Value iteration; policy iteration; TD learning; Q learning; actor-critic

UNIT-III

Introduction to Python: History and Origin of Python Language, Features, Python, Two modes of using Python interpreter, variable and data types, operator and their precedence, Python string & slicing, Python lists, mutable and immutable types, Input from keyboard. Loops and Iterations, Functions, Strings & Lists.

Modules and Packages: Python Modules and Packages, Different ways to import Packages, File Input/Output ,The pickle module, Formatted Printing, Exception Handling.

Arrays and Matrices: The NumPy Module, Creating Arrays and Matrices, Copying, Arithmetic Operations, Cross product & Dot product , Saving and Restoring, Matrix inversion, Vectorized Functions.

UNIT-IV

2D & 3D Data Visualization: The Matplotlib Module, Multiple plots, Polar plots, Pie Charts, Plotting mathematical functions, Sine function and friends, Parametric plots, Astroid, Ellipse, Spirals of Archimedes and Fermat, Polar Rose, Power Series & Fourier Series, 2D plot using colors, Fractals, Meshgrids, 3D Plots, Surface Plots & Line Plots, Wire-frame Plots, Mayavi, 3D visualization; Files and Streams:File modes and permissions, Reading & Writing data from a file, Redirecting output streams to files, Working with directories, CSV files and Data Files.

Python and Databases: ODBC and Python, Working with database in MySQL.

Machine Learning: Getting started, Mean, median, Mode, Deviation, percentile, Data distribution, Scatter plot, Regression

Suggested Readings:

1. Ethem Alpaydin: Introduction to Machine Learning, MIT Press, PHI, 3rd Edition 2014.
2. M. Gopal: Applied Machine Learning, TMH.
3. Tom Mitchell: Machine Learning, McGraw Hill.
4. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar: Foundations of Machine Learning, MIT Press, 2012.
5. Vinod Chandra and Anand Harindra: Artificial Intelligence and Machine Learning, PHI.
6. E. Alpaydin: Introduction to Machine Learning, Prentice Hall of India.
7. Ethem Alpaydin: Introduction to Machine Learning, PHI learning.
8. Pooja Sharma: Programming in Python", BPB Publications, 2017.

9. R. Nageswara Rao: Core Python Programming, Dreamtech.
10. Langley: Elements of Machine Learning, Morgan Kaufmann.
11. Hans Fangohr: Introduction to Python for Computational Science and Engineering(A beginner's guide).
12. Timothy A. Budd: Exploring Python, McGraw Hill Education
13. Mark Lutz: Learning Python 4th Edition, O'Reilly Publication
14. Jason Bell: Machine Learning: Hands-On for developers and Technical Professionals Wiley Publication, 2015
15. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA24DB2: WEB DEVELOPMENT USING PHP

Course Outcomes:

By the end of the course the students will be able to:

CO1: Understand regular expressions including modifiers, operators, and meta characters.
CO2: Create PHP programs that use various PHP library functions, and that manipulate files and directories.
CO3: Analyze and solve various database tasks using the PHP language.
CO4: Analyze and solve common Web application tasks by writing PHP programs.
CO5: Formulate, design and create PHP control structures, including selection and iterative structures

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-I

Introduction to PHP: Evolution of PHP & its comparison with other web programming languages, Interfaces to External systems, Hardware and Software requirements.

Basic PHP Development: PHP Scripting, Working of PHP scripts, Basic PHP syntax, PHP data types, Operators, Variable manipulation, Dynamic variables, Variable scope, and Accessing variable with the global statement Static vs. Dynamic Optimization, Google Caffeine.

Control Statements: if( ) and else if( ) condition Statement, The switch statement, Using while ( ) Loop, The do while statement, Using the for ( ) Loop, Breaking out of loops, Nesting loops.

UNIT-II

String & Arrays: Formatting String for Presentation, Formatting String for Storage, Joining and Splitting String, Comparing String, Matching and replace Substring. Arrays: Anatomy of an Array, Creating index based and Associative array, Accessing array Elements, Looping with Index based array, Looping with associative array using each( ) and foreach( ) loops, Library functions.

Functions: Function definition, Creation, Returning values, User-defined functions, Dynamic function, Function calls with the static statement, default arguments, passing arguments to a function by value.

UNIT-III

Forms: Working with Forms, Super global variables, Super global array, Importing user input, Accessing user input, Handling Html Form With PHP, Using hidden fields, Redirecting the user.

Working with File and Directories: Understanding file & directory, Opening and closing a file, Copying ; renaming and deleting a file, Working with directories, Building a text editor, File Uploading & Downloading.
Generating Images with PHP: Basics computer Graphics, Creating Image , Manipulating Image , Using text in Image.

Object Oriented concept using PHP: Classes, Objects, Polymorphism, Inheritance, Interface, Abstraction, Constructor, Destructor.

UNIT-IV

PHP with MySQL: Creating Connection, Selecting Database, Perform Database (query), Use returned data, close connections, file handling in PHP – reading and writing from and to FILE.

Advance PHP Techniques: Introduction about FTP/SMTP server, Math functions, File upload, File Download, E-mail with PHP, PHP configuration file, Error tackling and debugging.

PHP Project Development: Exposure of Requirements analysis of a Project and its development.

Suggested Readings:

1. Matt Doyle: Beginning PHP 5.3, Willey Publishing.
2. Steve Suehring, JavaScript Step by Step, Microsoft Press, PHI.
3. Harwani: Developing Web Applications in PHP and AJAX, McGraw Hill
4. P.J. Deitel & H.M. Deitel: Internet and World Wide Web- How to Program, Pearson.
5. Web Technologies, Black Book, Dreamtech Press.
6. Steven Holzner: PHP- The Complete Reference, Tata McGraw Hill.
7. Kevin Tetroi: Programming PHP, O' Reilly
8. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

21MCA24DB3: NEURAL NETWORKS & DEEP LEARNING

Course Outcomes:

By the end of the course the students will be able to:

CO1: To cover the fundamentals of neural networks and deep learning.

CO2: To cover advanced topics such as recurrent neural networks, long short term memory cells.

CO3: To understand Recurrent neural network, convolutional neural network and theorem for Generative models.

CO4: To implement programming assignments related to neural network's topics.

CO5: To understand the concept of Deep reinforcement learning.

Max. Marks: 100 (80+20) **Time: 3Hrs**

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 parts (short-answer type questions) covering the entire syllabus and will carry 16 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 16 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one quest ion from each Unit.

UNIT-1

Introduction: Biological neuron, Idea of Computational units, McCulloch-Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning algorithm, Linear separability; Convergence theorem for Perceptron Learning algorithm.

Feedforward Networks: Empirical Risk Minimization, Regularizing a deep network, model exploration and hyper parameter tuning.

Deep Learning: Historical context and motivation for deep learning, Basic Supervised classification task, Optimizing logistic classifier using gradient descent, Stochastic gradient descent, Momentum, and adaptive sub-gradient method.

UNIT-II

Deep Neural Networks: Difficulty of training deep neural networks, Greedy layerwise training.

Better Training of Neural Networks: Newer optimization methods for neural networks (Adagrad, Adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in Neural network, Regularization methods.

Recurrent Neural Network: Bidirectional RNNs, Encoder-Decoder sequence to sequence architecture, Backpropagation through time, Long Short Term Memory (LSTM), Gated Recurrent Units, Bidirectional LSTMs, Deep Recurrent networks.

UNIT-III

Convolutional Neural Networks: Basics of convolutional neural networks, stacking, striding and pooling, Applications such as image and text classification, LeNet, AlexNet.

Generative Models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, Gradient computations in RBMs, Deep Boltzmann Machines.

Recent Trends: Varitional Autoencoders (Undercomplete autoencoders, regularized autoencoders, sparse autoencoders, denoising autoencoders), Representational power, layer, size and depth of autoencoders, Stochastic encoders and decoders, Generative Adversarial Networks, Multi-Task Deep Learning, Multi-view Deep learning.

UNIT-IV

Deep Reinforcement Learning: Basic concepts of Deep Reinforcement Learning (DRL), DRL process and RL approaches, Algorithms of DRL(Value Learning, Policy Learning),Q-Learning algorithm and its implementation, Digging deeper into Q function, Deep Q Learning algorithm and its implementation with Tensorflow,Deep Q-Network, DRL Applications. Policy optimization: Introduction to policy-based methods, Policy Gradient; Model based RL, Recent Advances and Applications.

Suggested Readings:

1. Ian Goodfellow: Deep Learning, MIT Press.
2. Jeff Heaton: Deep Learning and Neural Networks, Heaton Research Inc.
3. Mindy L Hall: Deep Learning, VDM Verlag.
4. Li Deng, Dong Yu: Deep Learning: Methods and Applications (Foundations and Trends in Signal Processing), Now Publishers Inc.
5. Richard S. Sutton and Andrew G. Barto: Reinforcement Learning: An Introduction, Second Edition, MIT Press.
6. Wiering, Marco, and Martijn Van Otterlo: Reinforcement learning - Adaptation, Learning, and Optimization.
7. Russell, Stuart J., and Peter Norvig: Artificial Intelligence: AModern Approach, Pearson Education Limited.
8. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville: Deep learning, MIT Press.
9. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.