SYLLABUS AND SCHEME OF EXAMINATIONS
MASTER OF COMPUTER APPLICATIONS (MCA) REGULAR PROGRAMME W.E.F. 2016-17
MCA First Year

Programme Specific Outcomes:

The students upon completion of MCA **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 techniques, skills 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 teaching/software engineer as their career after acquiring necessary eligibility requirement.

Semester-I

Paper Code	Course	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
16MCA31C1	Mathematical Foundation of Computer Science	80	20	100	4:0:0
16MCA31C2	Computer Fundamentals and Programming in C	80	20	100	4:0:0
16MCA31C3	Digital Design	80	20	100	4:0:0
16MCA31C4	Internet and Web Designing	80	20	100	4:0:0
16MCA31C5	Object Oriented Programming Using C++	80	20	100	4:0:0
16MCA31CL1	Software Lab-1 i) Programming in C i) Web Programming Using HTML	100*	----	100	0:0:3
16MCA31CL2	Software Lab-2 Programming in C++	100*	----	100	0:0:3
					26 Credits

Semester-II

Paper Code	Course	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
16MCA32C1	Data Structures using C++	80	20	100	4:0:0
16MCA32C2	Computer Organization and Architecture	80	20	100	4:0:0
16MCA32C3	Complier Design	80	20	100	4:0:0
16MCA32C4	Data Base Management System	80	20	100	4:0:0
16MCA32C5	Visual Language Programming	80	20	100	4:0:0
16MCA32CL1	Software Lab-3 i) Data Structure implementation in C++ i) Programming in 8086/88/80x6 Assembly	100*	----	100	0:0:3
16MCA32CL2	Software Lab-4 i) Oracle & SQL Prog. ii) Visual Programming	100*	----	100	0:0:3
	Total Credits				**26 Credits**

Foundation Elective (F)	
To be Chosen from the pool of Foundation Electives provided by the university.	2

Total Credits= 28 Credits

*
20 marks out of 100 will be based on the 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.

MCA Second Year

Semester-III

Paper Code	Course	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
17MCA33C1	Computer Graphics	80	20	100	4:0:0
17MCA33C2	Operating Systems	80	20	100	4:0:0
17MCA33C3	Advance Database Systems	80	20	100	4:0:0
17MCA33C4	Data Communication and Computer Networks	80	20	100	4:0:0
17MCA33C5	Object Technology	80	20	100	4:0:0
17MCA33CL1	SoftwareLab-5 i) Graphics Programming Using C/C++. ii) UNIX /Shell Programming.	100*	----	100	0:0:3
17MCA33CL2	SoftwareLab-6 i) Java Programming ii)ADBMS (PL/SQL & MYSQL)	100*	----	100	0:0:3
					26 Credits

Semester-IV

Paper Code	Course	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
17MCA34C1	Advanced Java Programming	80	20	100	4:0:0

17MCA34C2	Object Oriented Analysis and Design using UML	80	20	100	4:0:0
17MCA34DA1/ 17MCA34DA2/ 17MCA34DA3	i) Theory of Computation or ii) Software Engineering or iii) Multimedia and Its Applications	80	20	100	4:0:0
17MCA34DB1/ 17MCA34DB2/ 17MCA34DB3	i) Analysis and Design of Algorithms Or ii) Computer Security or iii)Digital Image Processing	80	20	100	4:0:0
17MCA34C3	Artificial Intelligence and Expert System	80	20	100	4:0:0
17MCA34CL1	SoftwareLab-7 Advance Java Programming	100*	----	100	0:0:3
17MCA34CL2	Software Lab-8 i)Object Oriented Analysis and Design using UML ii) PROLOG	100*	----	100	0:0:3
17MCA34C4	Minor Project-I	-	100	100	0:2:0
	Total				**28 Credits**

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= 31 Credits

*
20 marks out of 100 will be based on the 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.

MCA Third Year

Semester-V

Paper Code	Course	University Exams	Internal Assessment	Total Marks	Credits (L:T:P)
18MCA35C1	Advanced Technology	80	20	100	4:0:0
18MCA35C2	Soft Computing	80	20	100	4:0:0
18MCA35C3	Data Warehousing and Data Mining	80	20	100	4:0:0
18MCA35DA1/ 18MCA35DA2/ 18MCA35DA3	(i) Cloud Computing or (ii) Big Data Analytics or (iii) Software Testing and Quality Assurance	80	20	100	4:0:0
18MCA35DB1/ 18MCA35DB2/ 18MCA35DB3	(i) Internet of Things or (ii) Mobile Computing or (iii) Embedded Systems	80	20	100	4:0:0
18MCA35CL1	Software Lab-9 .NET Programming Using C#	100 *	----	100	0:0:3
18MCA35CL2	Software Lab-10 Soft Computing	100*	----	100	0:0:3
18MCA35C6	Minor Project-II	-	100	100	0:2:0
	Total				**28 Credits**
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= 31 Credits

*
20 marks out of 100 will be based on the 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-VI

Paper Code	Course	University Exams	Internal Assessment	Total Marks	Credits
18MCA36C1	Major Project	400	100	500	20 Credits
	Grand Total of 3 Years/Credits				**162 Credits**

SEMESTER-1

SUBJECT- MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE
PAPER CODE-16MCA31C1

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

CO1 Identify and apply basic concepts of set theory, arithmetic, logic, proof techniques, binary relations, graphs and trees

CO2 Write an argument using logical notation and discriminate between valid and invalid arguments.

CO3 Demonstrate an understanding of relations and functions and be able to determine their properties and able to determine when a function is one to one, onto, many to many and so on.

CO4 Identify different types of matrices and able add, subtract, multiply matrices. Also able to calculate determinant, minors and cofactors of the matrices.

CO5 Identify different types of grammars used in automata and able to convert NFA to DFA and mealy to more machines.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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– I

Relation: Relations, Properties of Binary relation, Matrix representation of relations, Closures of relations, Equivalence relations, Partial order relation.
Function: Types, Composition of function, Recursively defined function.
Algebraic Structures: Properties, Semi group, Monoid, Group, Abelian group, Subgroup, Cyclic group,Cosets, Normal Subgroups, Lagrange's Theorem, Permutation groups.

UNIT – II

Propositional Logic: Prepositions, logical operations, Tautologies, Contradictions, Logical implication,Logical equivalence, Normal forms, Theory of Inference and deduction. Predicate Calculus: Predicates and quantifiers, Mathematical Induction.

UNIT – III

Lattices and Boolean Algebra: Introduction, Partially Ordered Set, Hasse diagram, Well ordered set, Lattices, Properties of lattices, Bounded lattices, Complemented and Distributive lattices, Boolean Algebra.

UNIT – IV

Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hierarchy, Regular expressions, Generalized Transition graph. Conversion of regular expression to Finite Automata, NFA, DFA, Conversion of NFA to DFA, Optimizing DFA and FA with output: Moore machine, Mealy machine, Conversions.

Suggested Readings:

1. C.L.Liu: Elements of Discrete Mathematics, McGraw Hill.
2. Lipschutz, Seymour: Discrete Mathematics, Schaum's Series
3. Babu Ram: Discrete Mathematics, Vinayek Publishers, New Delhi.
4. Trembley, J.P & R. Manohar: Discrete Mathematical Structure with Application to Computer Science, TMH.
5. Kenneth H. Rosen: Discrete Mathematics and its applications, TMH.
6. Doerr Alan & Levasseur Kenneth: Applied Discrete Structures for Computer Science, Galgotia Pub. Pvt. Ltd.
7. Gersting: Mathematical Structure for Computer Science, WH Freeman & Macmillan.
8. Hopcroft J.E, Ullman J.D.: Introduction to Automata theory, Languages and Computation, Narosa Publishing House, 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.

SUBJECT- COMPUTER FUNDAMENTALS AND PROGRAMMING IN C
PAPER CODE-16MCA31C2

Course Outcomes:

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

CO1 Design an algorithm solution for a given program.

CO2 Draw flow charts for the solution.

CO3 Understand and trace the execution of programs written in C language.

CO4 Write well document and indented program according to coding standards.

CO5 Debug a given program and execute the C program.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Computer Fundamentals: Concept of data and information, Components of Computer, Input and Output Device, Components of CPU, Memory and Storage Devices, Computer Software: System and Application Software, Overview of Operating System. Programming Languages Machine, Assembly, High Level Language, 4GL. Language Translator, Linker, Loader; Classification of Computers, Advantages and Limitations of Computer, Applications of Computer, Social concerns of Computer Technology: Positive and Negative Impacts, Computer Crimes, Viruses and their remedial solutions.

UNIT-II

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

C Programming Fundamentals: Keywords, Variables and Constants, Structure of a C program, Operators & Expressions: Arithmetic, Unary, Logical, Bit-wise, Assignment & Conditional Operators, 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.

UNIT-III

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.

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.

UNIT-IV

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. Kerninghan & 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

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

SUBJECT/COURSE- DIGITAL DESIGN
PAPER CODE-16MCA31C3

Course Outcomes:

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

CO1 Implement digital function in the form a digital logic
CO2 Perform binary arithmetic operations
CO3 Identify the sequential and combinational circuits
CO4 Implement most commonly used sequential and combinational circuits
CO5 Design memory system using flip-flop.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-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, Excess-3 Codes, Gray code, Self-complementing codes, Error-Detecting/Correcting codes, Alphanumeric Codes, Parity Bits, Hamming Code, Floating Point Numbers.

Binary Arithmetic: Basic Rules of Binary Addition and Subtraction, Addition and Subtraction Using 2's Complement Method, Booth Coding, Binary Multiplicity – repeated Left Shift and Add Algorithm, Binary Division – Repeated Right Shift and Subtract Algorithm.

UNIT-II

Positive and Negative Logic, Truth Tables, Logic Gates, Fan out of Logic Gates,

Logic Families: TTL Logic Family, CMOS Logic Family, ECL Logic Family, NMOS and PMOS Logic Family. Boolean Algebra vs. Ordinary Algebra, Boolean Expressions- Variables and Literals, Boolean Expressions–Equivalent and Complement, Theorems of Boolean Algebra, Minimisation Techniques, SOPs & POSs Boolean Expressions, Quine-McCluskey Tabular Method, Karnaugh Map Method.

UNIT-III

Combinational Circuits: Implementing Combinational Logic, Arithmetic Circuits –Basic Building Blocks, Adder and Subtractor, BCD Adder, Code Converters, Magnitude Comparator, Parity Generators/Checkers, Multiplexers, Demultiplexers, Decoders, Encoders, Read Only Memory (ROM), Programmable Logic Arrays (PLA)

Sequential Circuits: Latches, RS Flip Flop, Level Triggered and Edge Triggered Flip Flops, JK Flip-Flop, Master-Slave Flip Flops, T Flip-Flop, D Flip-Flops, Conversion of Flip-Flops, Applications of Flip-Flops.

UNIT-IV

Registers: Buffer Registers, Controlled Buffer Registers, Shift Registers and its types,Applications of Shift-registers.

Counters: Ripple Counter vs. Synchronous Counter, Modulus Counter, Propagation Delay in Ripple Counters, Binary Ripple Counters, Up/Down Counters, Decade and BCD Counters, Pre-settable Counters, RAM Architecture: Static RAM (SRAM), Dynamic RAM (DRAM).

Suggested Readings

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. Tokheim: Digital Electronics, TMH.

7. S. Rangnekar: Digital Electronics, ISTE/EXCE.L
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

SUBJECT/COURSE- INTERNET AND WEB DESIGNING
PAPER CODE-16MCA31C4

Course Outcomes:

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

- CO1 Review the current topics in Web & Internet technologies and describe the basic concepts for website and internet implementation.
- CO2 Learn the basic working scheme of the Internet and World Wide Web and understand fundamental tools and technologies for web design.
- CO3 Comprehend the technologies for Hypertext Mark-up Language (HTML), XML and specify design rules in constructing web pages and sites. Effectively deal with programming issues relating to VB Script, JavaScript, Java, ASP, Front Page and Flash.
- CO4 Create and Design websites. Figure out the various security hazards on the Internet and need of security measures.
- CO5 Create and use Cascading Style Sheet (CSS) and Information Architecture document for a web site and construct a web site that conforms to the web standards of today and includes e-commerce and web marketing.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Introduction to Web Engineering: Categories and Characteristics of Web Applications, The Internet, Basic Internet Protocols, Introduction to Intranet, Client-Server Environment, Web Browser and its functions, Web Servers and their features, WWW, Types of Computer Network: LAN, WAN, MAN, Network Topologies.

E-Mail Concepts: Sending and Receiving Files through E-Mail, Fighting Spam, Sorting and Searching Mails, Mailing List, Avoiding E-Mail viruses, Configuring E-Mail Program.

UNIT-II

Search Engines: Categories of Search Engines, Searching Criterion, Hypertext Transfer Protocol (HTTP), URL and DNS working, Usenet Newsgroup Concepts: Reading Usenet newsgroups, Internet Relay Chat.

Introduction to Blog: Using Wordpress, Introduction to social networking: Instant messaging, Web-Based chat rooms and discussion boards, Voice and Video conferencing, Streamlining Browsing, Keeping track of Favorite Web Sites, Web Security: Privacy and Site-Blocking.

UNIT-III

Web designing using HTML: Understanding HTML, XHTML Syntax and Semantics, HTML

Elements: Paragraph, Lists, Tables, Images, Frames, Forms, Linking to other Web Pages: External and Internal linking, E-mail Links, Working with Background colors and Images, Marquee, Text Alignment and Text Formatting, Advanced Layout with Tables; Publishing HTML Pages.

UNIT-IV

Cascading Style Sheets: Introduction, Inline, Internal and External CSS.

XML: Relation between XML, HTML, SGML, Goals of XML, Structure and Syntax of XML, Well Formed XML, DTD and its Structure, Namespaces and Data Typing in XML, Transforming XML Documents, XPATH, Template based Transformations, Linking with XML, Displaying XML documents in Browsers.

Suggested Readings:

1. Dick Oliver: Tech Yourself HTML 4 in 24 Hours, Techmedia.
2. Satish Jain: "O" – Level Information Technology.
3. Achyut Godbole, "Web Technologies", Tata McGraw Hill, India.
4. Craig Zacker: 10 minutes Guide to HTML Style Sheets, PHI.
5. V.K. Jain: "O" – Level Information Technology, BPB Publications.
6. Gill Nasib Singh: Essentials of Computer and Network Technology, Khanna Books Publishing Co., New Delhi.
7. Margaret Levine Young: Internet – The Complete Reference
8. Harley Hahn: The Internet – Complete Reference, TMH.
9. Rajender Singh Chhillar: Application of IT to Business, Ramesh Publishers, Jaipur.

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

SUBJECT/COURSE- OBJECT ORIENTED PROGRAMMING USING C++
PAPER CODE-16MCA31C5

Course Outcomes:

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

CO1 Use the characteristics of an object-oriented programming language in a program.

CO2 Use the basic object-oriented design principles in computer problem solving.

CO3 Apply C++ features to program design and implementation.

CO4 Design and implementation programs of Constructor, Destructor, and Inheritance.

CO5 Design and implementation programs of Polymorphism, Exception handling and also Design and implementation programs of Templates and Working with files.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

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

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

UNIT-II

Introduction to Class: Class Definition, Classes and Objects, Access Specifiers: Private, Public and Protected, Member functions of the class, Constructor and Destructor, Parameterized Constructor, Copy Constructors.

Inheritance: Reusability, Types of Inheritance: Single inheritance, Multiple, Multilevel, Hybrid Inheritance, Public, Private, and Protected Derivations, Using derived class, Constructor and destructor in derived class, Object initialization and conversion, Nested classes (Container classes), Virtual Inheritance and Virtual base class.

UNIT-III

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, This Pointer.

Exception handling: Throwing, Catching, Re-throwing an exception, specifying exceptions, processing unexpected exceptions, Exceptions when handling exceptions, resource capture and release.

UNIT-IV

Templates: Introduction, Class templates and Function templates, Overloading of template function, namespaces. Introduction to STL: Standard Template Library: benefits of STL, containers, adapters, iterator, vector, list.

Working with files: C++ streams, C++ stream classes, creating, opening, closing and deleting files, file pointers and their manipulators, updating file, random access to file, Error handling during file operations.

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. Object Oriented Programming and C++, R.Rajaram, New Age International.
8. Samanta: Object Oriented Programming with C++ & JAVA, PHI.
9. Subburaj: Object-Oriented Programming with C++, VIKAS.

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

SUBJECT/COURSE- SOFTWARE LAB-1
I). PROGRAMMING IN C

II). WEB PROGRAMMING USING HTML
PAPER CODE-16MCA31CL1

Max.Marks-100*

Course Outcomes:

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

CO1 Read, understand and trace the execution of programs written in C language.

CO2 Implement programs with pointers and arrays, perform arithmetic, and use the pre-processor.

CO3 Learn the basic working scheme of the Internet and World Wide Web and understand fundamental tools and technologies for web design.

CO4 Comprehend the technologies for Hypertext Mark-up Language (HTML), XML and specify design rules in constructing web pages and sites..

CO5 Create and Design websites and Figure out the various security hazards on the Internet and need of security measures. Also create and use Cascading Style Sheet (CSS) and Information Architecture document for a web site and construct a web site that conforms to the web standards of today and includes e-commerce and web marketing.

SUBJECT/COURSE- SOFTWARE LAB-2
I) PROGRAMMING IN C++
PAPER CODE-16MCA31CL2

Max. Marks-100*

Course Outcomes:

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

CO1 Implement the copy constructors and class member functions with suitable example.

CO2 Demonstrate on inheritance and virtual functions with suitable example.

CO3 To learn how to use basic principles of Exception Handling with Multiple Catch in programs.

CO4 To understand the Virtual Base Class in application with suitable example.

CO5 To elaborate on Function Overloading with suitable example.

SEMESTER-II
SUBJECT- DATA STRUCTURES USING C++
I).PAPER CODE-16MCA32C1

Course Outcomes:

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

CO1 Ability to analyze algorithms and algorithm correctness.

CO2 Ability to summarize searching and sorting techniques

CO3 Ability to describe stack, queue and linked list operation.

CO4 Ability to have knowledge of tree and graphs concepts.

CO5 Implementation in C++.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Introduction to Algorithm Design and Data Structures: Design and analysis of algorithm: Algorithm definition, comparison of algorithms. Top down and bottom up approaches to Algorithm design. Analysis of Algorithm; Frequency count, Complexity measures in terms of time and space. Structured approach to programming.

UNIT-II

Arrays: single and multidimensional arrays. Address calculation using column and row major ordering, various operations on Arrays. Vectors. Application of arrays.

Sorting: Selection sort, Insertion sort, Bubble sort, Quick sort, merge sort, Heap sort, Radix sort and their complexity.

Searching: Sequential and binary search, Indexed search, Hashing Schemes. Comparison of time complexity, Binary Search Tree, ASVL trees, B trees.

UNIT-III

Stacks and Queues: Representation of stacks and queues using arrays and linked-list. Circular queues, Priority Queue and D-Queue. 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.

UNIT-IV

Binary tree traversal methods: Preorder, 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.

Graph representation: Adjacency matrix, Adjacency lists, Traversal schemes: Depth first search, Breadth first search. Spanning tree: Definition, Minimal spanning tree algorithms. Shortest Path algorithms (Prim's and Kruskal's).

Suggested Readings:

1.Hubbard JR: Schaum's outline of Data Structures with C++, TMH.

2. R. Sedgewick: Algorithms in C++, Pearson Education Asia.

3. Y.Langsam, M.J.Augenstein and A.M.Tanenbaum: Data Structures Using C and C++, Prentice Hall of India.

4.R.Kruse, C.L.Tonodo and B.Leung: Data Structures and Program Design in C, Pearson Education.

5. S.Chottopadhyay, D.Ghoshdastidar & M.Chottopadhyay: Data Structures Through 'C' Language, BPB Publication.

4. G.L. Heileman: Data Structutes, Algorithms and Object Oriented Programming, Tata McGraw Hill.

5. E. Horowitz, Sahni and D. Mehta: Fundamentals of Data Structures in C++, Galgotia Publiction.

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.

SUBJECT- COMPUTER ORGANIZATION AND ARCHITECTURE
PAPER CODE-16MCA32C2

Course Outcomes:

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

CO1 Determine which hardware blocks and control lines are used for different instructions

CO2 Program in 8086/8088 assembly language for small applications

CO3 Implement ALU design using its constructs through relevant micro-operations

CO4 Identify the I/O techniques and memory hardware for design of memory systems

CO5 Differentiate parallel processors and pipelined designs

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Basic concept of Computer Organization and Computer Architecture, Operational concepts, Bus structures, Von Neumann Concept, Role of operating systems and compilers.

Basic Computer Design: Instruction codes, Computer Instructions and types, Instruction Set, Instruction Cycle – fetch, indirect, interrupt, execute; Flowchart for Instruction Cycle, Instruction Formats, Addressing Modes, Computer Registers, Bus System and its structure, Register Transfer Language terminology.

Programming in 8086/8088/80x6 Assembly Language: A/L program structure, segments, registers, instructions, macros, A/L directives.

UNIT-II

CPU Design: Microprocessor and CPU organization – Control Unit, ALU, CPU Registers, System Bus, Clock; Micro-operations and its types, Design of ALU, General Register Organization, Stack Organization, Data Transfer and Manipulation, Program control

Control Unit Design: Control Store, Micro programs, Control Unit of a basic computer – Timing and Control; Hardwired and Micro-programmed controlled unit, Microinstruction and its types, Microinstruction sequencing.

Architectures: RISC, CISC, Scalar, Superscalar and pipelined architectures.

UNIT-III

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

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

UNIT-IV

Introduction to parallel processing– Pipelining, Parallelism in unipolar systems, Parallel Computer structures, Architectural classification schemes. Principles of pipelining & Vector processing – Principles of Linear pipelining, Classification of pipeline processors, General pipelines and reservation tables, interleaved memory Organizations, Instruction and Arithmetic pipelines, Principles of designing pipelined processors, Vector processing Requirements.

Structures for array processors: SIMD Array processor, SIMD Interconnection networks. Parallel Processing Applications.

Suggested Readings:

1. Mano, M.M.: Computer System Architecture, Prentice-Hall of India.
2. Stallings, William: Computer Organisation & Architecture.
3. Gill Nasib Singh and Dixit J.B: Digital Design and Computer Organisation, University Science Press (Laxmi Publications), New Delhi.
4. Mano, M.M.: Digital Logic and Computer Design, Prentice-Hall of India.
5. Kai Hwang: Advanced Computer Architecture, McGraw Hill International
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.

SUBJECT- COMPILER DESIGN
PAPER CODE-16MCA32C3

Course Outcomes:

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

- CO1 Elaborate concepts of language compilation process and use the knowledge 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 compilers for various software needs.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Evolution of the Components of Systems Programming: Assemblers, Loaders, Linkers, Macros, Compilers. Software Tools: Variety of software tools, Text editors, Interpreters and program generators, Debug Monitor, 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

Syntax Directed definition: Construction of Syntax trees, Intermediate code generation, Intermediate Languages, Syntax trees, post fix form. Symbol table: contents of Symbol table, Data Structures for Symbol table; Runtime storage Administration.

UNIT-IV

Code Optimization and Code Generation: Principles sources of optimization, loop optimization, Dag Representation of Basic blocks. Code generation– problems in code generation, a simple code generator, Register allocation and Assignment, Peephole optimization.

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. 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.

SUBJECT- DATABASE MANAGEMENT SYSTEM
PAPER CODE-16MCA32C4

Course Outcome:

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

CO1 Understanding the database concept and structure, data modeling and development process.

CO2 Construct and normalize conceptual data models.

CO3 Implement a relational database into a database management system.

CO4 Use database management system(Oracle SQL Plus).

CO5 Become proficient in using query language(SQL).

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Introduction: Data base System Applications, data base System Vs. File Processing System, View of Data, Data Abstraction, Instances and Schemas, Data Models – ER Model, Relational Model, Other Models. Database Languages – DDL, DML, DCL. Database Access for applications Programs – data base Users and Administrator, Transaction Management, Data base System Structure, Storage Manager, Query Processor, History of Data base Systems. Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets, Relationships

and Relationship sets, Additional features of ER Model, Concept Design with the ER Model, Conceptual Design for Large enterprises.

UNIT-II

Relational Model: Introduction to the Relational Model, Integrity Constraint Over relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views, Destroying /altering Tables and Views.

Relational Algebra and Calculus: Relational Algebra, Selection and projection set operations, renaming, Joins, Division, Examples of Algebra overviews. Relational calculus– Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

UNIT-III

Form of Basic SQL Query: Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries Set, Comparison Operators, Aggregative Operators, NULL values, Comparison using Null values, Logical connectivity's – AND, OR and NOT. Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases. Schema refinement, Problems Caused by redundancy, Decompositions, Problem related to decomposition, Normalization: FIRST, SECOND, THIRD Normal forms, BCNF, Lossless join Decomposition, Dependency preserving Decomposition, Schema refinement in Data base Design, Multi valued Dependencies, forth Normal Form.

UNIT-IV

Overview of Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of transaction, Lock Based Concurrency Control, Performance Locking, Transaction Support in SQL, Introduction to Crash recovery.

Concurrency Control: Serializability, and recoverability, Introduction to Lock Management, Lock Conversions, Dealing with DeadLocks, Specialized Locking Techniques, Concurrency without Locking.

Introduction to PL/SQL: Advantages of PL/SQL, Generic PL/SQL Block, Execution Environment, Control Structure, Transactions, Security, database objects.

Suggested Readings:

1. Silberschatz, Korth: Data base System Concepts, McGraw Hill.
2. Raghurama Krishnan: Data base Management Systems, Johannes Gehrke, Tata McGraw Hill.
3. P. Radha Krishna: Database Management Systems, HI-TECH Publications.
4. C.J.Date: Introduction to Database Systems, Pearson Education.
5. Rob & Coronel: Data base Systems design, Implementation, and Management, Thomson.
6. Elmasri Navrate: Data base Management System, Pearson Education.
7. Mathew Leon: Data base Management System Leon Vikas.
8. Connoley: Data base Systems, Pearson education.

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

SUBJECT- VISUAL LANGUAGE PROGRAMMING
PAPER CODE-16MCA32C5

Course Outcomes:

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

CO1 Design, create, build, and debug Visual Basic applications and explore Visual Basic's Integrated Development Environment (IDE).

CO2 Implement syntax rules in Visual Basic programs. And explain variables and data types used in program development and apply arithmetic operations for displaying numeric output.

CO3 Write and apply decision structures for determining different operations, lop structures to perform repetitive tasks, procedures, sub-procedures, and functions to create manageable code.

CO4 Create one and two-dimensional arrays for sorting, calculating, and displaying of data and to write Visual Basic programs using object-oriented programming techniques including classes, objects, methods, instance variables, composition, and inheritance, and polymorphism.

CO5 Students will be able to design Windows applications using forms, controls, and events.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-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.

UNIT-III

Advanced Controls in VB: Introduction: Scroll Bar, Slider Control, Tree View, List View, Rich Text Box Control, Toolbar, Status Bar, Progress Bar, Cool bar, Image List, Tab Strip.

Working with Graphics: Using Paint, Line, Circle, RGB and other related method, **M**anipulating graphics.

UNIT-IV

File Handling in VB: Creating a File, Saving and Opening files in Rich text box and Picture box, Handling file operations.

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

ActiveX controls: Creating & Using ActiveX Controls, Creating & Using ActiveX Documents, ActiveX EXE vs. ActiveX DLL.

Suggested Readings:

1. Visual Basic 6 Programming: Black Book By Steven Holzner, Dreamtech PRESS
2. Mastering Visual Baisc 6 By Evangelos Petroutsos BPB
3. Programming in Visual Basic 6.0 By Julia Case Bradley & Anita C. Millspaugh Tata McGraw-Hill.
4. Step by Step Microsoft Visual Basic 6.0 Professional By Michael Halvorson PHI
5. Visual basic 6 Complete BPB
6. Teach Yourself Visual basic 6 By Scott Warner Tata McGraw-Hill Edition
7. Using Visual Basic 6 Special Edition By Brian Siler and Jeff Spotts PHI
8. Internet & World Wide Web How to Program, Pearson Education,H.M. Deitel, P.J. Deitel, A.B. Goldberg.

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

SUBJECT- SOFTWARE LAB-3
I) DATA STRUCTURE IMPLEMENTATION IN C++
II) PROGRAMMING IN 8086/88/80X6 ASSEMBLY
PAPER CODE-16MCA32CL1

Course Outcomes:

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

CO1 Ability to analyze algorithms and algorithm correctness.
CO2 Ability to summarize searching and sorting techniques
CO3 Ability to describe stack, queue and linked list operation.
CO4 Ability to have knowledge of tree and graphs concepts implementation in C++.
CO5 Programming in 8086/88/80x6 Assembly

SUBJECT- SOFTWARE LAB-3
I) ORACLE AND SQL PROG.
II) VISUAL PROGRAMMING
PAPER CODE-16MCA32CL2

Course Outcomes:

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

CO1 Write queries against single and multiple tables, manipulate data in tables and create database objects. Use group functions to report aggregated data and Create PL/SQL blocks of application code that can be shared by multiple forms, reports and data management applications.
CO2 Develop anonymous PL/SQL blocks, stored procedures and functions. Declare identifiers and trap exceptions, Use DML statements to manage data, Use DDL statements to manage database objects and Declare PL/SQL Variables.
CO3 Conditionally control code flow (loops, control structures), Describe stored procedures and functions and Retrieve row and column data from tables.
CO4 To Design, formulate, and construct applications with VB and Integrate variables and constants into calculations applying VB. Discuss logical alternatives with VB decision structures and Implement lists and loops with VB controls and iteration. Separate operations into appropriate VB procedures and functions, Assemble multiple forms, modules, and menus into working VB solutions.
CO5 To Create Visual basic programs using multiple array techniques, Build integrated VB solutions using files and structures, Active X controls and graphics. Translate general requirements into data-related solutions using database concepts.

SEMESTER-III
SUBJECT- COMPUTER GRAPHICS
PAPER CODE-17MCA33C1

Course Outcomes:

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

CO1 Distinguish between different types of Computer Graphics and Scan systems used for display.

CO2 Design and draw any Euclidean two or three dimensional objects by using different algorithms.

CO3 Perform geometric and co-ordinate transformations to enhance the quality of graphics object.

CO4 Apply interior or exterior clipping operations on all possible shapes using different criteria.

CO5 Design an animation by using two and three dimensional graphics concept

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Overview of Graphics System: Computer Graphics and Its Types; Application of Computer Graphics; Video Display Devices: CRT, Raster Scan Systems, Random Scan System; Color CRT Monitors, Refresh CRT and Interlacing; DVST, Emissive and Non- Emissive Display devices; Hard copy devices; Graphics Software Standards; Color Models: RGB,CMY, HLS; Color and Gray Scale Levels.

UNIT-II

Scan Conversion: Scan Converting a Point, Line, Circle and Ellipse; Anti- aliasing.

Two-Dimensional Geometric Transformations: Basic Transformations (Translation, Rotation, Scaling), Matrix Representations and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing.

UNIT-III

Polygon Filling: Scan-Line Polygon Fill Algorithm, Inside-Outside tests, Boundary-Fill Algorithm, Flood Fill Algorithm, Cell Array, Character Generation.

Two-Dimensional Viewing: The Viewing Pipeline, Window to View port coordinate Transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping for Convex and Concave polygons, Text Clipping, Exterior Clipping.

UNIT-IV

Three–Dimensional Concepts: Three Dimensional Display Methods: Parallel Projection and Perspective Projection; 3D Transformations; Bezier Curves vs. B-Spline Curves; Shading methods: Flat Shading, Gouraud Shading, Phong Shading.

Animation: Design of Animation Sequence; Classification of Animation; Components of Multimedia; Authoring Process and Tools.

Case Study: A graphics software:- MatLab, Uses of MatLab in Graphics Application, Features of MatLab, Generalize application by using MatLab.

Suggested Readings:

1. Donald Hearn and M.Pauline Baker: Computer Graphics, PHI Publications
2. Plastock : Theory & Problem of Computer Graphics, Schaum Series.
3. Pardeep K. Bhatia: Computer Graphics, I.K. International Publishing House.
4. Foley & Van Dam: Fundamentals of Interactive Computer Graphics, Addison-Wesley.
5. Newman : Principles of Interactive Computer Graphics, McGraw Hill.
6. Tosijasu, L.K. : Computer Graphics, Springer-verleg.
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.

SUBJECT- OPERATING SYSTEMS
PAPER CODE-17MCA33C2

Course Outcomes:

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

- CO1 Identify different operating systems on the basis of characteristics
- CO2 Identify different states of processes and how to handle the process in a particular state.
- CO3 Students are able to work in cooperating environment with the help of different synchronization tools.
- CO4 Identify whether the system is deadlocked and how to handle deadlock
- CO5 Write shell scripts as per their requirements and able to work with different editors of shell.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Operating System Introduction- Functions, Characteristics, Structures - Simple Batch, Multi programmed, timeshared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Systemcomponents, Operating-System services, System Calls, Virtual Machines.

Process and CPU Scheduling - Process concepts and scheduling, Operation on processes, CooperatingProcesses, Threads, and Interposes Communication Scheduling Criteria, Scheduling Algorithm, Multiple-Processor Scheduling, Real-Time Scheduling.

UNIT-II

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping,Contiguous Allocation, Paging, Segmentation, Segmentation with Paging. Demand

Paging, Performanceof Demanding Paging, Page Replacement, Page Replacement Algorithm, Allocation of Frames, Thrashing.

UNIT-III

File System Interface and Implementation -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management, Directory Management, Directory Implementation, Efficiency and Performance.

Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors.

UNIT-IV

Deadlocks - System Model, Dead locks Characterization, Methods for Handling Deadlocks Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.
I/O Management – I/O software and its types, Disk Scheduling.

Shell Programming: Concept of shell, Types of shell, Editors for shell programming (e.g. vi), basics of Shell programming.

Case Study- UNIX, LINUX, and Windows NT.

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. A.S. Tanenbaum: Modern Operating Systems, Pearson/PHI.
6. Dhamdhere: Operating Systems, Tata McGraw Hill.
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.

SUBJECT- ADVANCE DATABASE SYSTEMS
PAPER CODE-17MCA33C3

Course Outcomes:

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

CO1 Understand the fundamentals of DBMS and conceptual design using EER model with prerequisite .
CO2 Understand differences between OODBMS and ORDBMS with their various features.
CO3 Learn the concepts of Client-Server technology, Parallel and distributed database with their architectures and concepts..
CO4 Learn how to retrieve information and analysis of data using mining approach.
CO5 To understand the concepts of advance databases and emerging technologies such as cloud computing and big data with their various framework.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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 – I

The Enhanced Entity-Relationship Model and Object-Oriented Database:

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.

UNIT II

Object Relational and Extended Relational databases: 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, Decision Support Systems, Data Warehousing: fundamental Concepts, architecture, data flow, tools and techniques, data warehouse design, OOLP. Data Mining: KDD process, primitives, types of data mining, association, classification and clustering.

UNIT-III

Parallel and Distributed Databases and Client-Server Architecture:

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 – IV

Enhanced Data Models for Advanced Applications & Emerging Technologies: 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,

Cloud based databases: data storage systems on cloud, cloud storage architectures, cloud data models**; Big data:** storage and analysis of Big data.

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

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

SUBJECT- DATA COMMUNICATION AND COMPUTER NETWORKS

Course Outcomes:

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

CO1 Independently understand basic computer network technology.

CO2 Understand and explain Data Communications System and its components.Different types of network topologies and protocols.

CO3 Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.

CO4 Identify the different types of network devices and their functions within a network. Understand and building the skills of subnetting and routing mechanisms.

CO5 Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Data Communication: Theoretical basis of data communication; analog and digital signals; asynchronous and synchronous transmission; data encoding and modulation, techniques, broadband and base band transmission; pulse code modulation, bandwidth, channel, baud rate of transmission; multiplexing; transmission medium.

UNIT-II

Network Classification: Local area networks, metropolitan area network, wide area network, and wireless network, Internetworking Devices: Hub, Repeaters, Bridge, Switch, Router and Gateway.

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

UNIT-III

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; satellite networks, X.25, frame relay, narrow band and broad band ISDN, asynchronous transfer modes.

UNIT-IV

Network functions and protocols: Switching mechanism: Circuit switching, message switching, packet switching, cell switching, routing and congestion control. **Transport Layer:** UDP, TCP, Frame Format of TCP and UDP.

Network Applications: File Transfer Protocol, electronic mail, World Wide Web.

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. 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.

SUBJECT- OBJECT TECHNOLOGY
PAPER CODE-17MCA33C5

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

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Object-Oriented Languages: Java's History, Creation of Java, 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, Concept of Interface.

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

UNIT-III

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.

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

UNIT-IV

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 Texts: 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.

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

SUBJECT- SOFTWARE LAB-5
I) GRAPHICS PROGRAMMING USING C/C++
II) UNIX/SHELL PROGRAMMING
PAPER CODE-16MCA32CL1

Course Outcomes:

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

CO1 To draw different shapes and objects by using inbuilt graphical functions in C language.
CO2 To draw basic geometric two dimensional shapes by using different scan converting algorithms.
CO3 To translate, rotate, scale, shear, clip and reflect the two and three dimensional objects.
CO4 Make an animation by performing different graphical operations.
CO5 Understand the Programming in Unix/shell.

SUBJECT- SOFTWARE LAB-6
I) JAVA PROGRAMMING
II) ADBMS(PL/SQL)
PAPER CODE-16MCA32CL2

Course Outcomes:
By the end of the course the students will be able to implement the various concepts in JAVA like that:

CO1 The student will demonstrate on method overloading with suitable example.
CO2 The student will understand the multilevel inheritance with suitable example.
CO3 Demonstrate on create a Thread from Thread class and runnable interface with suitable example.
CO4 To elaborate on runtime polymorphism with suitable example and the student will demonstrate on applet with differentiate between main () method using suitable example.
CO5 Creating Database and understanding its importance.

SEMESTER-IV
SUBJECT- ADVANCED JAVA PROGRAMMING
PAPER CODE-17MCA34C1

Course Outcomes:
At the end of course the students should be able to:

CO1 Explain the use of HTML 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 using concepts learnt so far.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-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 Servelet 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.

SUBJECT- OBJECT ORIENTED ANALYSIS AND DESIGN USING UML
PAPER CODE-17MCA34C2

Course Outcomes:

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

CO1	Understand Object Oriented concepts, terms and principles
CO2	Gain knowledge of object oriented systems analysis and design techniques and models
CO3	Develop use cases - both diagrams and narratives
CO4	Model an overall system using UML class diagrams and sequence diagram.
CO5	Develop activity diagrams.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to question no. 1, the examiner is required to set eight more questions selecting two from each unit. 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. All questions will carry equal marks.

UNIT – I

UML: Principles of modeling, UML Things – Structural, Behavioral, Grouping, Annotational. Relationships in UML – Dependency, Association, Generalization, Realization. Overview of diagrams in UML – Class diagram, Object diagram, Use-Case diagram, Sequence diagram, Collaboration diagram, Statechart diagram, Activity diagram, Component diagram, Deployment diagram. UML Semantic Rules – Names, Scope, Visibility, Integrity, Execution. Mechanisms in the UML – Specifications, Adornments, Common Divisions, Extensibility Mechanisms.

UNIT – II

Modeling as a Design Technique: Abstraction, Encapsulation, Modularity, Hierarchy, Typing, Concurrency, Persistence of objects. Purpose of modeling,

Class Model – Object & Class, Links & Associations, Generalization & Inheritance, Association Ends - Multiplicity, Role names, Ordering, Qualification, Aggregation, Link attributes & Link class, Abstract class, Metadata, Constraints.

UNIT – III

State Modeling: Event, State, Activity, Action, Transitions & Conditions, State diagrams, Nested state diagrams, signal generalization, concurrency, relationships between class and state models.

Interaction Modeling: use case models, use case relationships, sequence models, procedural sequence models, activity models, special constructs for activity models.

UNIT – IV

System Analysis & design: System development stages, system conception, analysis, domain class model, domain state model, iterating the analysis. class model, application.

System Design: estimating performance, make a reuse plan, organize the system into subsystem, identifying concurrency, allocating subsystems to processors and tasks, management of data stores, handling global resources, choosing software control strategies, handling boundary conditions, setting trade-off priorities, selecting an architect style.

Suggested Readings:

1. Bernd Bruegge, Allen H. Dutoit, Object Oriented Software Engineering using UML, Pearson Education.
2. M. Blaha, J. Rumbaugh, Object-Oriented Modeling and Design with UML, Pearson Education.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Pearson education.
4. Satzinger, Jackson, Burd, Object-Oriented Analysis & Design with the Unified Process, Thomson.
5. Grady Booch, Object Oriented Analysis & Design, Addison Wesley.
6. Timothy C. Lethbridge, Robert Laganiere, Object Oriented Software Engineering, (Tata McGraw-Hill).

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

SUBJECT- THEORY OF COMPUTATION
PAPER CODE-17MCA34DA1

Course Outcomes:

After completing this course, students will be able to:

CO1 Analyze and design finite automata, formal languages, and grammars.
CO2 Explain the basic concepts of deterministic and non-deterministic finite automata, regular language, context-free language, Turing machines
CO3 Find ambiguous grammars, able to construct derivative trees
CO4 Describe the formal relationships among machines, languages and grammars
CO5 Distinguish different computing languages and classify their respective types.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Finite Automata: Languages: Alphabets, String, Language, Basic operations on language, Union, Concatenation, Kleene closure, Regular Expressions, Deterministic Finite Automata, Non- deterministic Finite Automata, Equivalence of Deterministic and Non-Finite Automata, Properties of the Languages Accepted by Finite Automata. Moore and Mealy Machines.

UNIT-II

Grammars: Definition, Context free and Context sensitive grammar, Parse trees, Ambiguity in grammars, Reduced forms, Removal of useless Symbols and unit production, Chomsky Normal Form (CNF), Greibach Normal Form (GNF).

UNIT-III

Pushdown Automata: Definitions, Moves, Instantaneous Description, Deterministic Pushdown Automata, Equivalence of Pushdown Automata and CFL, Pumping lemma for CFL, Applications of Pushdown Automata.

UNIT-IV

Turing Machines: Turing Machine as a model of computation, Design of T.M, Universal Turing machine, Language Acceptability, Halting problem.
Computability: Basic concepts, Primitive Recursive Functions.

Suggested Readings:

1. Introduction to automata theory, language & computations- Hopcroaft & O.D.Ullman, R.Mothwani, 2001, AW.
2. Daniel I.A. Cohen, Introduction to Computer Theory, Second Edition, John Wiley, 1997.
3. Theory of Computer Sc. (Automata, Languages and computation): K.L.P.Mishra & N.Chandrasekaran, PHI.
4. Introduction to formal Languages & Automata-Peter Linz, Narosa Publ..

5. Fundamentals of the Theory of Computation- Principles and Practice by Ramond Greenlaw and H. James Hoover, Harcourt India Pvt. Ltd..
6. Elements of theory of Computation by H.R. Lewis & C.H. Papaditriou, PHI.
7. Introduction to languages and the Theory of Computation by John C. Martin,T.M.H.

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

SUBJECT- SOFTWARE ENGINEERING
PAPER CODE-17MCA34DA2

Course Outcomes:

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

CO1 Knowledge of basic concepts and models of Software Engineering.

CO2 Use Software Requirements Engineering and Software Metrics, Measures.

CO3 Knowledge of Software Design Processes and CASE tools.

CO4 Knowledge and implementation of Software Testing methods and Software Reliability.

CO5 Knowledge of Software Maintenance Activities and software documentation.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Introduction to Software Engineering: Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models. Software Project Management: Management activities, Project planning, Project scheduling, Risk management activities.

UNIT-II

Software Requirements Engineering: Requirements Engineering Processes, Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management; Software Requirements: Functional and non-functional requirements, User requirements, System Requirements, Interface specification, software requirement specification document; IEEE Standards for SRS, CCC for Requirements.

Software Metrics and Measure: Process Metrics, Project metrics, Halestead's Software Science, Function Point (FP), Cyclomatic Complexity Measures; Software Project Estimation Models- Empirical, Putnam, COCOMO models.

UNIT-III

Software Design Process: 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, Interface Design, Coding, Computer Aided Software Engineering (CASE), CASE Tools.

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

UNIT-IV

Software Maintenance Activities: Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change

Control Process, Software Version Control, Software Reuse, Software Evolution, Software Quality Attributes, Software Quality Assurance – plans & activities, Software Documentation.

Suggested Readings:

1. Pressman: Software Engineering, TMH.
2. Gill, Nasib Singh: Software Engineering, Khanna Book Publishing Co.(P) Ltd, N. 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.

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

SUBJECT- MULTIMEDIA AND ITS APPLICATIONS
PAPER CODE-17MCA34DA3

Course Outcomes:

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

CO1 Design Multimedia by incorporating different components of multimedia effectively.
CO2 Identify different 3D technologies including HDTV, UDTV and Hyper speech.
CO3 Perform dithering on 24 bit color and 8 bit color and 8 bit grey images.
CO4 Compress the photographs and videos by applying lossy as well as loss less techniques.
CO5 Make an animated multimedia by incorporating different enhanced features.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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

Basics of Multimedia Technology: Computers, communication and entertainment; multimedia introduction; framework for multimedia systems; multimedia devices; CD- Audio, CD-ROM, CD-I, presentation devices and the user interface; multimedia presentation and authoring; professional development tools; LANs and multimedia; internet, World Wide Web & multimedia distribution network-ATM & ADSL; multimedia servers & databases; vector graphics; 3D graphics programs; animation techniques; shading; anti aliasing; morphing; video on demand.

UNIT-2

Compression and Decompression Techniques : Types of Compression, Binary Image Compression Schemes, Color, gray scale, still-video image compression, Discrete Cosine Transform, Video Image compression, MPEG Coding methodology, Audio Compression, Data and File format standards- RTF, TIFF,RIFF, MIDI, JPEG, AVI, JPEG, TWAIN Architecture.

UNIT-3

Audio & Video: Digital representation of sound; time domain sampled representation; method of encoding the analog signals; subband coding; fourier method; transmission of digital sound; digital audio signal processing; stereophonic & quadraphonic signal processing; MPEG Audio; audio compression & decompression; brief survey of speech recognition and generation; audio synthesis; musical instrument digital interface; digital video and image compression; MPEG motion video compression standard; DVI technology; time base media representation and delivery.

UNIT-4

Multimedia Application Design : Types of Multimedia systems, desktop virtual reality, VR operating system, Virtual Reality Design - Components of Multimedia system, intelligent VR software systems. Distributed Application Design Issues, Multimedia Authoring and User Interface, Hypermedia Messaging, Distributed Multimedia Systems.

Suggested Readings:

1. An introduction, Villamil & Molina, Multimedia Mc Milan, multimedia: Sound & Video, Lozano, PHI, (Que)
2. Multimedia: Production, planning and delivery, Villamil & Molina,Que.
3. Multimedia on the PC, Sinclair,BPB
4. Multimedia: Making it work, Tay Vaughan, TMH.
5. Multimedia in Action by James E Shuman, Wadsworth Publ.,
6. Multimedia in Practice by Jeff coate Judith,PHI.
7. Multimedia Systems by Koegel, AgWL
8. Multimedia Making it Work by Vaughar, etl.
9. Multimedia Systems by John .F. Koegel, Buford.
10. Multimedia Communications by Halsall & Fred, AW

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

SUBJECT- ANALYSIS AND DESIGN OF ALGORITHMS
PAPER CODE-17MCA34DB1

Course Outcomes:

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

CO1 Prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains;

CO2 Analyze worst-case running times of algorithms using asymptotic analysis.

CO3 Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate.
CO4 Compare between different data structures. Pick an appropriate data structure for a design situation.
CO5 Apply the algorithms and design techniques to solve problems.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Sets and disjoint sets, union, sorting and searching algorithms and their analysis in terms of space and time complexity.

Divide and Conquer: General method, binary search, merge sort, quick sort, selection sort, Strassen's matrix multiplication algorithms and analysis of algorithms for these problems.

UNIT-II

Greedy Method: General method, Knapsack problem, Job sequencing with deadlines, Minimum spanning trees- Prim's and Kruskal's algorithms, Single source paths- Dijkastra algorithms and analysis of these problems.

Dynamic Programming: General method, Optimal binary search trees, 0/1 Knapsack, Traveling Salesperson Problem.

UNIT-III

Back Tracking: General method, 8 Queen's Problem, Graph coloring, Hamiltonian cycles and analysis of these problems.

Branch and Bound: Method, 0/1 Knapsack and Traveling Salesperson Problem, efficiency considerations.

UNIT-IV

NP Hard and NP Complete Problems: Basic concepts, Cook's theorem, NP hard graph and NP scheduling problems some simplified NP hard problems.

Advanced data structures: Red-Black trees, B-trees, Fibonacci Heaps.

Suggested Readings:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, Galgotia Publ.
2. Introduction to Algorithms, Thomas H Cormen, Charles E Leiserson And Ronald L Rivest: TMH.
3.The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., Addison Wesley.
4. Algorithms-The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., Johan Wiley & Sons.
5. Writing Efficient Programs, Bentley, J.L., PHI.
6. Introduction to Design and Analysis of Algorithm, Goodman, S.E. & Hedetnieni, MGH.
7. Introduction to Computers Science- An algorithms approach , Jean Paul Trembley, Richard B. Bunt, T.M.H.
8. Fundamentals of Algorithms: The Art of Computer Programming Voll, Knuth, D.E., Naresh Publication.

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

SUBJECT- COMPUTER SECURITY
PAPER CODE-17MCA34DB2

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

CO1 Apply security measures to commonly used computer resources
CO2 Identify the possible threats and apply protection mechanisms
CO3 Classify sensitive data and its relevance
CO4 Identify malicious and non-malicious codes
CO5 Determine ethical and legal issues of computer security

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Security Problem in Computing: meaning of Computer Security, Computer Criminals, Methods of Defense, Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption Algorithms, The Data Encryption Standard, The AES Encryption Algorithm, Public Key Encryptions, Uses of Encryption.

UNIT-II

Program Security: Secure Programs, Non-malicious Program Errors, viruses and other malicious code, Targeted Malicious code, controls Against Program Threats, Protection in General-Purpose operating system protected objects and methods of protection, File protection Mechanisms, User Authentication Designing Trusted O.S : Security polices, models of security, trusted O.S. design, Assurance in trusted OS, Implementation examples.

UNIT-III

Database Security: Security requirements, Reliability and integrity, Sensitive data, Inference, multilevel database, proposals for multilevel security.

Security in Network: Threats in Network, Network Security Controls, Firewalls, Intrusion Detection Systems, Secure E-mail.

UNIT-IV

Administering Security: Security Planning, Risk Analysis, Organizational Security policies, Physical Security. Legal Privacy and Ethical Issues in Computer Security: Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Praia, Ethical issues in Computer Security, Case studies of Ethics.

Suggested Readings:

1. P. Pfleeger, Shari Lawrence Pfleeger Charles: Security in Computing, PHI.
2. William Stallings: Cryptography & Network Security, Pearson Education.

3. Charlie Kaufman, Radia Perlman, Mike Speciner: Network Security, Private communication in a public world, PHI.
4. Douglas R.Stinson: Cryptography – Theory and Practice, CRC Press.
5. Bruce Schneier , Niels Ferguson: Practical Cryptography, Wiley Dreamtech 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

SUBJECT- DIGITAL IMAGE PROCESSING
PAPER CODE-17MCA34DB3

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

CO1 Process, quantize and to perform sampling on given images.
CO2 Transform and filter the digital image for improving the image quality.
CO3 Generate Color images by applying different image characteristics using different color models.
CO4 Compress the digital images by applying different lossless and lossy compression techniques.
CO5 Identify different representations and restoration of digital images.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 (short parts -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 – I

Introduction to Digital Image Processing: Applications of digital image processing, Steps in digital image processing, Components of an Image Processing system, Image sampling and Quantization, Relationships between pixels.

Image Enhancement: Intensity transformations and spatial filtering, Point and Mask based techniques, Histogram processing, Fundamentals of spatial filtering, Smoothing and sharpening spatial filters.

UNIT – II

Filtering in frequency domain: Fourier series and Transform, Discrete Fourier Transform, Frequency Domain Filtering Fundamentals, Homomorphic Filtering.

Color Image Processing: Color Fundamentals, Color characteristics, Color models, RGB, CYK, CMYK, HIS, YIQ models, Pseudo color image processing, full color image processing, color transformations, Smoothening and sharpening of images.

UNIT – III

Image Restoration: Model of Image Degradation/Restoration process, Noise models, Linear, Inverse filtering, Mean Square Error Restoration, Least Square Restoration.

Image Compression Fundamentals: Lossless and Lossy Compression, Basic Compression Methods: Huffman Coding, Run-Length Coding, LZW Coding, Arithmetic Coding, Bit-Plane Coding, Predictive Coding, Transform Coding, Wavelet Coding, Compression standards.

UNIT – IV

Image Segmentation: Fundamentals, Point, Line and Edge Detection, Thresholding, Region-Based Segmentation.

Image Representation: Boundary Representation, Chain Codes, Polygonal Approximations, Signatures, Boundary Descriptors, Simple Descriptors, Shape Numbers, Regional Descriptors, Topological Descriptors, Texture.

Suggested Readings

1. Gonzalez R.C., Woods R.E., "Digital Image Processing", Pearson Education.
2. Vipula Singh, "Digital Image Processing with MATLAB and LABVIEW", Elsevier India.
3. Ganzalez R.C., "Digital Image Processing with MATLAB", Tata McGraw Hill.
4. Sonka Milan, "Image Processing Analysis and Machine vision", Cengage Learning.
5. William K. Pratt, "Digital Image Processing", Wiley India Pvt. Ltd.
6. Chanda B., Majumder D. Dutta, "Digital Image Processing and Analysis", PHI Learning.
7. Jain A.K., "Fundamental of Digital Image Processing", PHI Learning.
8. Jayaraman S., Esakkirajan S., Veerakumar T., "Digital Image Processing", Tata McGraw Hill.
9. Annadurai, "Digital Image Processing", Pearson Education

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

SUBJECT- ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM
PAPER CODE-17MCA34C3

Course Outcomes:

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

- CO1 Learn the concept of Artificial intelligence, problem solving with example and searching process.
- CO2 Understand basic concepts of Expert system with its architecture and development life cycle.
- CO3 Understand the concepts of knowledge, acquisition of knowledge and various levels and schemes with the help of which knowledge can be represented.
- CO4 Learn the concepts of perception, basic concepts of Neural network, learning in neural network with its applications.
- CO5 Handle the uncertainty in knowledge using fuzzy logic and understand various concept of fuzzy logic. Illustrate the concepts of AI using Prolog.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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 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-I

Introduction: Definition and applications of Artificial intelligence, Problem solving: Defining the problem as state space search, Production system, Problem characteristics, Search techniques: Generate and test, Hill climbing, Best first search, A* algorithm, Problem reduction, Expert system: Definition, Role of knowledge in expert system, Architecture of expert system.

UNIT-II

Expert system development life cycle: Problem selection, Prototype construction, Formalization, Implementation, Evaluation, Knowledge acquisition: Knowledge engineer, Cognitive behavior, Acquisition techniques, Knowledge representation: Level of representation, Knowledge representation schemes, Formal logic, Inference Engine, Semantic net, Frame, Scripts.

UNIT-III

Perception: Sensing, Speech recognition, Vision, Action, Neural networks : Introduction, Comparison of artificial neural networks with biological neural networks, Learning in neural networks, Perceptrons, Back propagation networks, application of neural networks, Fuzzy logic : Definition, Difference between Boolean and Fuzzy logic, fuzzy subset, fuzzy membership function, fuzzy expert system, Inference process for fuzzy expert system, fuzzy controller.

UNIT-IV

Programming in Logic (PROLOG): Introduction, Prolog variables, Using rules, Input and Output predicates, Fail and cut predicates, Recursion, Arithmetic operation, Compound object, Dynamic database, Lists, String, File operations.

Suggested Readings:

1. David W. Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill Book Company.
2. Elaine Rich, Kevin Knight: Artificial Intelligence, Tata McGraw Hill.
3. Carl Townsend: Introduction to Turbo Prolog, BPB
4. Stamations V. Kartalopous: Understanding Neural Networks and Fuzzy Logic, PHI

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

SUBJECT- SOFTWARE LAB-7
I). ADVANCED JAVA PROGRAMMING LAB
PAPER CODE-17MCA34CL1

Course Outcomes:

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

CO1 Develop Swing-based GUI, client/server applications and TCP/IP socket programming
CO2 Develop Update and retrieve the data from the databases using SQL
CO3 Develop distributed applications using RMI
CO4 Develop component-based Java software using JavaBeans
CO5 Develop server side programs in the form of servlets.

SUBJECT- SOFTWARE LAB-8
I). OBJECT ORIENTED ANALYSIS AND DESIGN USING UML
II). PROLOG
PAPER CODE-17MCA34CL2

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

- CO1 Understand various object oriented concepts and methodologies.
- CO2 Build object oriented analysis model using UML.
- CO3 Identify design requirement by creating a design model.
- CO4 Develop use cases, sequence, and activity and class diagrams and develop model in Rational Rose software.
- CO5 Illustrate the concepts of AI using Prolog.

Subject- Minor project-I
Paper code-17MCA34C4

Course Outcomes:
Upon successful completion of this Minor Project the students will be able to:

- CO1 Identify a task or problem relevant to computer science and/or IT
- CO2 Propose a solution to the task or problem
- CO3 Explore tools/technologies/languages that may enable design/develop the solution/application
- CO4 Develop a reasonable application/software in tune with the requirements
- CO5 Implement the solution/application in tune with the requirements

SEMESTER-V
SUBJECT- ADVANCED TECHNOLOGY
PAPER CODE-18MCA35C1
COURSE OBJECTIVES AND OUTCOMES

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

- CO1 Design simple web applications and window applications.
- CO2 Develop, implement and creating Applications with C#.
- CO3 Develop, implement, and demonstrate Component Services, Threading, Remoting, Windows services.
- CO4 Understand and be able to explain Security in the .NET framework and Deployment in the .NET.
- CO5 Learn about the ADO.NET, the feature, controls and code to connect database with front end using ODBC, OLEDB, and SQL, and how to develop web form and data connectivity in ASP.NET.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Introduction to .Net Framework: Microsoft .net Platform, Design Goals and Overview, .net architecture, Console, environment, IL, JIT, .NET framework class library, Common language runtime, CLR Execution, common type system, common language specification, managed and unmanaged code.

UNIT-II

Introduction to VB.Net: .Net features, Data Types, OOPS Concepts: Constructor, Destructor, and Abstraction, interface, polymorphism (Over loading and over ridding).

Introduction to C#: Data Types, Operators, Garbage Collection, Jagged Array, Collection (Array list, Hash table), Indexer(One Dimension) and property, Delegates and events (Multicasting, Multicasting Event),Exception Handling.

UNIT-III

Introduction to ADO.Net : Basic window control, Architecture of ADO.Net, Comparison wit h ADO, Connected and Disconnected Database, Create Connection using ADO.NET Object Model, Connection Class, .Net Data provider, Data Adapter, Data Set, Data Row, Data Column, Data Relation, command, Data Reader, Language integrated query(LINQ).

Database Accessing on Web applications: Data Binding concept with web, Creating Data Grid, Data binding with windows forms, Binding standard web server controls, Display data on web form using Data bound controls and Data Grid.

UNIT-IV

Introduction to ASP.Net : Features, Anatomy of ASP.NET Page.

ASP.NET Controls: Using HTML Controls, Using Web Controls, Using Validation controls. **State Management:** session, caching, Authentication(window,.Net Passport, Forms Based), Authorization, web services, Advance Grid Manipulation, Data connectivity using ASP.net.

Suggested Readings:

1. Jeffrey Richter, Francesco Balena: Applied .Net Framework Prog. 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. 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.

SUBJECT- SOFT COMPUTING
PAPER CODE-18MCA35C2

Course Outcomes:

CO1 Ability to analyze the applications which can use fuzzy logic.

CO2 Ability to design Fuzzy Inference Systems and Fuzzy Controller.

CO3 Ability to understand the difference between learning and programming and explore practical applications of Neural Networks (NN).

CO4 Ability to appreciate the importance of optimizations and its use in computer engineering fields and other domains.

CO5 Students would understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Introduction: Introduction to soft computing, introduction to biological and artificial neural network; introduction to fuzzy sets and fuzzy logic systems.

Introduction to Genetic Algorithm: Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues.

UNIT-II

Artificial neural networks and applications: Different artificial neural network models; learning in artificial neural networks; neural network applications in control systems. Neural Nets and applications of Neural Network.

UNIT-III

Fuzzy systems and applications: fuzzy sets; fuzzy reasoning; fuzzy inference systems;fuzzy control; fuzzy clustering; applications of fuzzy systems.

Neuro-fuzzy systems: neuro-fuzzy modeling; neuro-fuzzy control.

UNIT-IV

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

Suggested Books:

1. M. Mitchell: An Introduction to Genetic Algorithms, Prentice-Hall.
2. J.S.R.Jang, C.T.Sun and E.Mizutani: Neuro-Fuzzy and Soft Computing, PHI, Pearson Education.
3. Timothy J.Ross: Fuzzy Logic with Engineering Applications, McGraw-Hill.
4. Davis E.Goldberg: Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley.

5. S. Rajasekaran and G.A.V.Pai: Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI.
6. D. E. Goldberg: Genetic Algorithms in Search, Optimization, and Machine Learning, Addison-Wesley.

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

SUBJECT- DATA WAREHOUSE AND DATA MINING
PAPER CODE-18MCA35C3

Course Outcomes:

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

CO1 Compare different types of data and to propose different techniques for its analysis based on the data type.
CO2 Perform the pre-requisite phases: **Extract, Transform and Load** on the given dataset.
CO3 Prepare the given dataset by applying different pre- processing techniques to clean n transform and reduce the data.
CO4 Implement different data mining techniques on the pre- processed data set for extracting hidden patterns from data.
CO5 Evaluate different techniques and proposed models by using different performance evaluators.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Data Warehouse: 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 for multidimensional data: star, snowflake and galaxy schemas

UNIT-II

Data warehouse and OLAP technology: Difference between OLTP and 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.

UNIT-III

Data preprocessing: Need, Preprocessing stages: Data integration, Data Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Data mining primitives, Types of Data Mining, Architectures of data mining systems. Data Characterization: Data generation & Summarization based characterization, Analytical characterization, Mining class comparisons. Mining Association Rules in large databases: Association Rule mining, Single dimensional Boolean association rules from Transactional DBS, Multi level association rules from transaction DBS, Multidimensional association rules from relational DBS and DWS, Correlation analysis, Constraint based association mining.

UNIT-IV

Classification and Prediction: Basic Classification & Prediction Model, Difference between Classification & Prediction. Classification Algorithms: Decision tree induction, Back propagation, Bayesian classification, classification based in association rules. Prediction Algorithms: Regression approach: Linear & Non Linear regression. Classifier Accuracy & Predictor Error Measures. Cluster analysis: Purpose, Types: Partitioning and Hierarchical methods, Density based methods. Applications of Data Mining: Web mining, Temporal and Spatial data mining.

Suggested Readings:

1. W.H.Inmon: Building Data Ware House, John Wiley & Sons.
2. S . Anahory and D.Murray: Data warehousing, Pearson Education, ASIA.
3. Jiawei Han & Micheline Kamber: Data Mining - Concepts & Techniques, Harcourt India PVT Ltd. (Morgan Kaufmann Publishers).
4. Michall Corey, M.Abbey, I Azramson & Ben Taub: Oracle 8i Building Data Ware Housing, TMH.
5. I.H. Whiffen: Data Mining, Practical Machine Learing tools & techniques with Java (Morgan Kanffmen)
6. Sima Yazdanri & Shirky S. Wong: Data Ware Housing with oracle.
7. A.K. Pujari: Data Mining Techniques, University Press.
8. IBM An Introduction to Building the Data Warehouse, PHI Publication.
9. Pieter Adriaans Dolf Zantinge: Data Mining, Addition Wesley.
10. David Hand, Heikki Mannila, and Padhraic Smyth: Principles of Data Mining, PHI Publication.
11. Anahory S., Murray D. :Data Warehousing in the Real World, Addison Wesley.
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.

SUBJECT- CLOUD COMPUTING
PAPER CODE-18MCA35DA1

Course Outcomes:

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

- CO1 Compare cloud from cluster and grid based on their architecture.
- CO2 Deploy web services from inside as well as from outside the cloud.
- CO3 Design the cloud by proposing different services provided by a cloud: **SaaS, IaaS** and **PaaS**.
- CO4 Enhance the performance of the designed cloud by performing the load balancing.
- CO5 Encrypt, tokenize and obfuscate to secure the cloud.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 7 parts (objective type/short-answer type questions) covering the entire syllabus and will

carry 28 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 18 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-I

Cloud Computing Fundamentals: Cloud Computing definition: private, public and hybrid cloud; Evolution of Cloud Computing; Characteristics of Cloud, Cloud Types; Cloud Computing Benefits and Limitations, Cloud Architecture; 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.

UNIT II

Cloud Computing service models: Introduction to Cloud Services: : SaaS, IaaS, PaaS; Storage As a Service, Communication As a Service; Cloud-based big data/real time analytics, Understanding SOA; Improving Performance through Load Balancing.

Virtualization Basics: Objectives, Benefits of Virtualization, Emulation, Virtualization for Enterprise, VMware, Server Virtualization, Data Storage Virtualization.

UNIT III

Cloud vendors and Service Management: Amazon cloud, AWS Overview, Installation of AWS, Google app engine, azure cloud, salesforce.

Service Management in Cloud Computing: Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously , Managing Data: Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud , Large Scale Data Processing.

UNIT IV

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, Commercial and business considerations.

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, Wile.
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.

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

SUBJECT- BIG DATA ANALYTICS
PAPER CODE-18MCA35DA2

Course Outcomes:

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

CO1 Analyze the given BIG DATA with different characteristics in different environment.
CO2 Predict the error in BIG DATA by taking samples based on different statistical functions.
CO3 Manipulate the data streams by filtering and estimating it.
CO4 Work with Hadoop, the data analysis tool, to analyse BIG DATA.
CO5 Propose a secure and efficient data analysis model by visualizing the large data sets.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 8 (short parts -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 I

Introduction To Big Data: Introduction to Big Data, Challenges of Big Data, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting, Modern Data Analytic Tools, Statistical Concepts: Sampling Distributions, Statistical Inference, Prediction Error.

UNIT II

Mining Data Streams: Introduction To Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating, Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform(RTAP) Applications.

UNIT III

Hadoop: History of Hadoop, The Hadoop Distributed File System, Components of Hadoop, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, 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.

UNIT IV

Hadoop Environment: Setting up a Hadoop Cluster, Cluster specification, Cluster Setup and Installation, Hadoop Configuration, Security in Hadoop, Visualizing Large Data Sets with D3, Big Data in E-Commerce and IT, Big Data in Energy Consumption, Social and Health Science.

Suggested Readings:

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer.
2. Tom White, “ Hadoop: The Definitive Guide” Third Edition, O’reilly Media.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing.

4. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons.
6. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons.
7. Pete Warden, "Big Data Glossary", O'Reilly.
8. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Elsevier, Reprinted.
9. Da Ruan,Guoquing Chen, Etienne E.Kerre, Geert Wets, Intelligent Data Mining, Springer.
10. Paul Zikopoulos ,Dirk deRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corrigan , Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications.
11. Michael Minelli (Author), Michele Chambers (Author), Ambiga Dhiraj (Author) , Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses,Wiley Publications.
12. 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.

SUBJECT- SOFTWARE TESTING AND QUALITY ASSURANCE
PAPER CODE-18MCA35DA3

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

CO1 Knowledge of various Software Testing techniques.
CO2 Use Software Testing Strategies and Metrics for Software testing.
CO3 Knowledge of Object Oriented Testing strategies.
CO4 Knowledge of Software Reliability, and Software Quality Assurance.
CO5 Knowledge of Quality management standards and methods.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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-I

Software Testing and the related concepts: significance and potential; Testability and features of Test cases. Software Testing techniques; WBT, BBT, Ticking Box testing; static analysis, symbolic testing, program mutation testing, input space , partitioning, functional program testing, data flow guided 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 etc.

UNIT-III

Object Oriented Testing: OOT strategies and issues, Test Case design, interface testing. Software Quality Assurance: concept, importance and essence; FTR, structured walk through technique etc.

UNIT-IV

SW Reliability and SQA: SW Reliability, validation, Software Safety and Hazards Analysis; Features affecting software quality, SQA Plan. Using project management software tools, Quality management, issue, standards and methods. ISO Quality models: ISO 9000 and SEI-CMM and their relevance.

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 N.S.: 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.

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

SUBJECT- INTERNET OF THINGS
PAPER CODE-18MCA35DB1

Course Outcomes:

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

- CO1 To identify the vision of IoT and its future roadmap
- CO2 To Understand IoT Market perspective
- CO3 To help implementing Data and Knowledge Management and use of Devices in IoT Technology.
- CO4 To Understand State of the Art - IoT Architecture
- CO5 To classify Real World IoT Design Constraints, Industrial Automation in IoT.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 7 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 28 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 18 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 -I

Definitions and Functional Requirements, Motivation, Architecture: Web 3.0, View of IoT, Ubiquitous IoT, Applications, Four Pillars of IoT, DNA of IoT, The Toolkit Approach for End-

user Participation in the Internet of Things. Middleware for IoT: Overview, Communication middleware for IoT, IoT Information Security.

UNIT- II

Protocol Standardization for IoT, Efforts, M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards, Protocols, IEEE 802.15.4, BACNet Protocol, Modbus, KNX, Zigbee Architecture, Network layer, APS layer Security.

UNIT -III

Basics of Sensors and actuators: examples and working principles of sensors and actuators – Cloud computing and IOT, Equivalent Microcontroller platform ,Setting up the board, Programming for IOT, Reading from Sensors Communication: Connecting microcontroller with mobile devices, communication through bluetooth and USB, connection with the internet using wifi / Ethernet.

UNIT -IV

Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things, Network Dynamics: Population Models, Information Cascades.

Dynamics: Structural Models, Cascading Behaviour in Networks, The Small-World Phenomenon; Web of Things versus Internet of Things, Two Pillars of the Web, Architecture Standardization for WoT.

Suggested Reading:

1. The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press.
2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles- (Eds.) – Springer.
3. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press.
4. The Internet of Things: Applications to the Smart Grid and Building Automation by – Olivier Hersent, Omar Elloumi and David Boswarthick – Wiley.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley.

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

SUBJECT- MOBILE COMPUTING
PAPER CODE-18MCA35DB2

Course Outcomes:

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

CO1 Describe the basic concepts and principles in mobile computing.

CO2 Understand the concept of Wireless LANs, PAN, Mobile Networks, and Sensor Networks.

CO3 Explain the structure and components for Mobile IP and Mobility Management.

CO4 Understand positioning techniques and location-based services and applications and describe the important issues and concerns on security and privacy. Apply the fundamental design paradigms and technologies to mobile computing applications.

CO5 Appraise the quality and performance of mobile applications, MANET and assess and implement security principles in mobile applications.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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 - I

Introduction to Mobile Communications and Computing: Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture. GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services. (Wireless) Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT – II

Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT- III

Database Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, pushbased mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

UNIT – IV

Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

Protocols and Tools: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

Suggested Reading:

1. Jochen Schiller,"Mobile Communications",Addison-Wesley. (Chapters 4,7,9,10,11).

2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley. (Chapters 11, 15, 17, 26 and 27)

3.Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press.

4.Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional.

5. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer.

6. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley DreamTech.

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

SUBJECT- EMBEDDED SYSTEMS

PAPER CODE-18MCA35DB3

Course Outcomes:

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

CO1 Foster ability to understand concepts.
CO2 Basics of embedded systems.
CO3 Use the 8051 microcontroller and its architecture.
CO4 Program in assembly language for the 8051.
CO5 Design and develop basic level embedded systems.

Maximum marks: 100 (**External: 80**, **Internal: 20**) **Time:** 3 hours

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 – I

Embedded Computing: Introduction, Complex Systems and Microprocessor, The Embedded System Design Process, Formalisms for System Design, Design Examples

The 8051 Architecture : Introduction, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts.

UNIT – II

Basic Assembly Language Programming Concepts: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051.

Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, Further Details on Interrupts.

UNIT – III

Applications: Interfacing with Keyboards, Displays, D/A and A/D Conversions, Multiple Interrupts, Serial Data Communication. Introduction to Real – Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment

UNIT – IV

Basic Design Using a Real-Time Operating System: Principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Saving Memory and Power, An example RTOS like uC-OS (Open Source); Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System.

Suggested Reading:

1. Wayne Wolf, Computers and Components, Elsevier India Private Limited.
2. Kenneth J.Ayala, The 8051 Microcontroller, Thomson.
3. David E. Simon, An Embedded Software Primer, Pearson Education.
4. Embedding system building blocks, Labrosse, via CMP publishers.
5. Raj Kamal, Embedded Systems, Tata McGraw Hill.
6. Ajay V Deshmukhi, Micro Controllers, Tata McGraw Hill.
7. Frank Vahid, Tony Givargis, Embedded System Design, John Wiley.
8. Raj Kamal, Microcontrollers, Pearson Education.

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

SUBJECT- SOFTWARE LAB-9
I). .NET PROGRAMMING USING C#
PAPER CODE-18MCA35CL1

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

CO1 Design, implement and creating web applications and window applications Using C#.
CO2 Develop, implement, and demonstrate Component Services, Threading, Remoting, Windows services.
CO3 Develop applications by implementing security concepts in the .NET framework.
CO4 Learn about feature, controls and code to connect database with front end using ODBC, OLEDB, and SQL using ADO.NET,
CO5 Able to develop web form using ASP.NET and learn to implement data connectivity in ASP.NET.

SUBJECT- SOFTWARE LAB-10
I). SOFT COMPUTING
PAPER CODE-18MCA35CL2

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

CO1 Ability to analyze the applications which can use fuzzy logic.
CO2 Ability to design Fuzzy Inference Systems and Fuzzy Controller.
CO3 Ability to understand the difference between learning and programming and explore practical applications of Neural Networks (NN).
CO4 Ability to appreciate the importance of optimizations and its use in computer engineering fields and other domains.
CO5 Students would understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications.

SUBJECT- MINOR PROJECT-II
PAPER CODE-18MCA35C6

Course Outcomes:
Upon successful completion of this Minor Project the students will be able to:

CO1 Identify a task or problem relevant to computer science and/or IT
CO2 Propose a solution to the task or problem
CO3 Explore tools/technologies/languages that may enable design/develop the solution/application
CO4 Develop a reasonable application/software in tune with the requirements
CO5 Implement the solution/application in tune with the requirements

SEMESTER-VI

SUBJECT- MAJOR PROJECT

PAPER CODE-18MCA36C1

Course Outcomes:

Upon successful completion of this Major Project the students will be able to:

CO1 Develop ability to apply theoretical and practical tools/techniques to solve any real life problems by undertaking:

- The Complete problem definition and Evaluate a problem definition.
- Determine how to collect information to determine requirements and Work on data collection methods for fact finding.
- Schedule projects using relevant techniques and Software documentation.
- Prepare and evaluate a final report and developing the ability to communicate effectively.