SCHEME OF EXAMINATION

&

DETAILED SYLLABUS
(w. e. f. Academic Year 2010-2011)

For

MASTER OF COMPUTER APPLICATIONS
(MCA) DEGREE

GURU GOBIND SINGH
INDRAPIRASTHA UNIVERSITY
KASHMERE GATE, DELHI
# FIRST SEMESTER EXAMINATION

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<td>Fundamentals of Information Technology</td>
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<td>Programming in C</td>
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<td>Discrete Mathematics</td>
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**Practical**

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**NUES**

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**Total** 15 17 26

* Non-University Examination System (NUES)
## SECOND SEMESTER EXAMINATION

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* Non-University Examination System (NUES)
**Master of Computer Applications**

**THIRD SEMESTER EXAMINATION**

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**NUES**

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| Total    |            |                                      | 15 | 17  | 26     |

* Non-University Examination System (NUES)
# FOURTH SEMESTER EXAMINATION

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(It is suggested to have Process Modeling Management Oriented Course)

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* Non-University Examination System (NUES)
## Master of Computer Applications

### FIFTH SEMESTER EXAMINATION

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<td>044305</td>
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<td>Enterprise Computing with Java</td>
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**Elective - I (Choose any One)**

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**NUES**

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* Non-University Examination System (NUES)
Master of Computer Applications

SIXTH SEMESTER EXAMINATION

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* Non-University Examination System (NUES)

The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

**Note:**
1. The total number of the credits of the MCA programme = 160.
2. Each student shall be required to appear for examinations in all courses. However, for the award of the degree a student shall be required to earn the minimum of 150 credits
INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVE: This course is an introductory course in information technology. Topics include foundations in hardware, software, data and an overview of the use of information technology in organizations. Topics include basics of graphics, systems development, database design and networking. Upon completion of this course the student should be able to:

- Describe the major components of information technology applications:
- Hardware, computer networks, software, data, processes, and people.
- Describe the different components of a computer network.
- Demonstrate an understanding of different types of networks.
- Define "Software Engineering".
- Demonstrate an understanding of the importance of algorithms in the development of IT applications.
- Discuss the role of databases in IT applications.

PRE-REQUISITE:
- None

UNIT – I
Digital Signals and Logic gates, Number systems: Binary, octal and hexadecimal number systems, signed binary number, binary arithmetic, 2’s complement arithmetic. Microprocessors: Introduction, System Bus, Architecture and operation of 8085 microprocessor and instruction set. [No. of Hrs: 10]

UNIT – II

UNIT - III
Introduction to Operating system, Different types of operating systems and its working, DOS commands, File Structure and Storage, Introduction to process management: process, threads, scheduling and synchronization. Introduction to Database Management System and its types. [No. of Hrs: 10]

UNIT – IV
Basic elements of a Communication System, Data transmission media, Digital and Analog Transmission, Network topologies, Network Types (LAN, WAN and MAN), Introduction to Communication protocols, Inter networking tools. [No. of Hrs: 10]
TEXT BOOKS:

REFERENCES:
OBJECTIVES: After covering the core C in about 25 lectures the course shall aim to acquaint the students about advanced features of the language the following features are listed as suggested guideline for the teacher.

- Passing by value and pass by reference
- Difference between array names and pointers
- Allocating memory over the heap to two dimensional array (Matrices application could be taken as a case study)
- Pointer and pointer operations (Linked lists, doubly linked lists circular linked lists can be taken as a case study)
- Pointers to functions and call back functions
- Bitwise operations and a case based upon these operations
- MACROs and their pitfalls
- Final case study could be an application making extensive handling of binary files.

PRE-REQUISITE:
- Basic Programming

UNIT- I

UNIT-II
Further Data Types: Defining New Data Types, Structures, Unions, Type-Casting, Enumerated Types, Low Level Operators and Bit Fields (Bitwise Operators, Bit Fields), Pointers: Pointers arithmetic and Arrays, const pointers, void pointers, near, far and huge pointers, Dynamic Memory Allocation and Dynamic Structures: (malloc, calloc, realloc; sizeof, free, introduction to Linked Lists and dynamic 2-dimensional arrays), Advanced Pointer Topics: (Pointers to Pointers, Pointer to array, Array of pointers, Command line input, Pointers to a Function, Implementing Callbacks) [No. of Hrs.: 12 Hrs]

UNIT -III
The C Preprocessor: (#define, #undef, #include, #if -- Conditional inclusion, Other Preprocessor Commands), C, Linux and Standard Libraries: (Advantages of using Linux with C, Using...
**Linux System Calls and Library Functions**

Integer Functions, Random Number, String Conversion, Searching and Sorting: `<stdlib.h>`

Mathematics: `<math.h>` (Math Functions, Math Constants), Input and Output (I/O): `<stdio.h>`

Reporting Errors (`perror()`, `errno`, `exit()`)

Streams (Predefined Streams, Redirection)

Basic I/O (Formatted I/O, `printf`, `scanf`), String Handling: `<string.h>` (Basic String Handling Functions and safety issues, String Searching), Character Conversions and Testing: `<ctype.h>`.

Files Character and Line Based I/O, Formatted I/O, Block I/O, File Positioning, Status Functions, Deletion and Renaming, Temporary Files

[No. of Hrs.: 11 Hrs]

**UNIT - IV**

File Accessibility and Directories (access, stat, chmod, chown, chdir, chroot...), Process Control: (Running Linux Commands from C, `fork()`, the `exec` family, `wait()`, `exit()`), Thread creation-a simple implementation.

[No. of Hrs.: 09 Hrs]

**TEXT BOOKS:**


**REFERENCES:**

INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVES: This course covered the mathematical topics most directly related to computer science. Learning Outcome of this course is to prepare students to take courses related with Data Structure, Algorithm analysis and Cryptography. This course develops ability to write independent mathematical Proofs.

PRE-REQUISITE:
• Basic Mathematics

UNIT – I

UNIT – II
Lattices: sub lattices, direct product, definition of Boolean algebra, properties, isomorphic structures (in particulars, structures with binary operations) sub algebra, direct product and homomorphism, Boolean function, Boolean expression, representation & minimization of Boolean function. Principle of Well Ordering Recursive definitions, solution methods for linear, first-order recurrence relations with constant coefficients.  

UNIT – III
GCD, LCM, Permutation function, composition of cycles. Fundamental Theorem of Arithmetic, primes, Congruence, Euler Phi function, Fermat’s Little Theorem, Primality and Factoring, Simple Cryptosystems, RSA Cryptosystem. Groups, Group identity and uniqueness, inverse and its uniqueness, isomorphism and homomorphism, subgroups, Cosets and Lagrange’s theorem, Permutation group and Cayley ‘s theorem (without proof), Error Correcting codes and groups, Normal subgroup and quotient groups.  

UNIT – IV
Graph Terminology, Isomorphism, Isomorphism as relations, Cut-Vertices, Planar graphs, Euler’s formula (proof), four color problem and the chromatic number of a graph, Eu ler graphs, Hamiltonian graphs, five color theorem, Vertex Coloring, Edge Coloring. Trees terminology, in order, preorder & post order trees traversal algorithms, directed graphs, Computer representation of graphs.  

[No. of Hrs: 12]

[No. of Hrs: 08]

[No. of Hrs: 12]

[No. of Hrs: 10]
TEXT BOOKS:

REFERENCES:
OBJECTIVE: The main objective of the syllabus is to make students understand the relevance of Computer Organization in the software oriented course. It aims at introducing basic digital concepts and then use them to explain details of computer organization.

PRE-REQUISITE:
- Basics of Digital Electronics
- Internal Components of the CPU

UNIT – I
Register Transfer and Microoperation: Register transfer language, register transfer, bus and memory transfer, arithmetic microoperations, logic microoperations, shift microoperations. [No. of Hrs: 12]

UNIT – II
Basic Computer Organization and Design: Instruction codes, computer registers, computer instructions, timing & control, instruction cycle, memory reference instructions, input-output and interrupts, design of basic computer, design of accumulator logic.
Microprogrammed Control Unit: Control memory, address sequencing.
Central Processing Unit: Introduction, general register organization, stack organization, instruction formats, addressing modes. [No. of Hrs: 11]

UNIT – III
Pipeline and Vector processing: Parallel Processing, pipelining, arithmetic pipeline, RISC Pipeline, Vector Processing, Array Processors.
Input-Output Organization: Peripheral devices, input-output interface, asynchronous data transfer, modes of data transfer, priority interrupt, direct memory access, input-output processor. [No. of Hrs: 10]

UNIT – IV
Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware.
Multiprocessors: Characteristics of multiprocessor, Interconnection Structure, Interprocessor Communication & Synchronization. [No. of Hrs: 09]

TEXT BOOKS:

REFERENCES:
OBJECTIVE: The purpose of this course is to expose the student to the basic concepts of management in order to aid the student in understanding how an organization functions, and in understanding the complexity and wide variety of issues managers face in today’s business firms.

PRE-REQUISITE:
- None

UNIT – I

UNIT – II
Organizing: Concept, Organization Theories, Forms of Organizational Structure, Combining Jobs: Departmentation, Span of Control, Delegation of Authority, Authority & Responsibility, Organizational Design.

UNIT – III

UNIT – IV
TEXT BOOKS:

REFERENCES:
There will be following Practical:

1. Fundamentals of IT Lab  
2. Problem Solving Using C Lab  
3. Computer Organization Lab  

MCA 151  
MCA 153  
MCA 155
Code No. : MCA 161  
Paper: General Proficiency – I*

It is suggested to have a fundamental course on Personality Development and Communication Skills – I in this semester.

This paper is under Non University Examination system its detail content will be decided by the respective Institute, under approval of the coordination committee based on the requirement of individual institution.

*Non University Examination Scheme (NUES)

There will not be any external examination of the university. The performance of the candidates should continuously be evaluated by an internal committee. The committee may conduct viva-voce at the end for the award of the marks.
OBJECTIVE: In this course student will become familiar with Algorithm analysis: Trees, Graphs, searching and sorting and files.

PRE-REQUISITES:
- C Programming
- Basic Concepts in Data Structure
- Prelims of Trees and Graphs Functionality of Group Theory

UNIT – I
Fundamentals of algorithm analysis Big ‘O’ notations, Time and space complexity of algorithms, linked lists: singly and doubly linked lists, stacks, queues, double stack, multistacks and multiquotes, deques, polynomial arithmetic, infix, postfix and prefix arithmetic expression conversion and evaluations. [No. of Hrs: 08]

UNIT – II
Trees: Binary trees: Definition, Binary Search Tree basic operations, Tree Traversals (recursive and stack based non-recursive), Heaps and priority queues, Threaded binary tree, AVL Trees  B-Tree: need, properties, creation, uses. B+ tree, B* tree. [No. of Hrs: 10]

UNIT – III
Graphs: Representation (Matrix and Linked), Traversals, Connected components, Spanning trees, Shortest path and Transitive closure, Topological sort, Activity network, Critical path, Path enumeration. Dijkstra’s Algorithm, Floyd Warshall’s Algorithm, Coloring of Graphs, Spanning Tree, Minimum Spanning Tree Algorithms (Kruskal’s Algorithm, Prim’s Algorithm)
Searching & Sorting: Binary search, Hash function, Hash table, Search tree. Internal sort: Radixsort, Insertion sort, Selection sort, Shell sort, Quick sort, Merge sort, Heap sort. [No. of Hrs: 16]

UNIT – IV
Files: Sequential file organization, creating updating retrieving from sequential files advantages and disadvantages of sequential file organization. Data representation and density, parity and error control techniques, devices and channels, double buffering and block buffering, handling sequential files in C language, seeking, positioning, reading and writing binary files in C. External Sorting and merging files k way and polyphase merge [No. of Hrs: 08]

TEXT BOOKS:
REFERENCES:
INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVES: After covering the core C++ in about 25 lectures the course shall aim to acquaint the students about advanced features of the language the following features are as suggested guideline for the teacher.

- Copy constructor, Deep and shallow coping, assignment operator and destructors, when the programmer must implement these
- Static and late binding. Run time and comile time polymorphism, virtual functions and VTABLE
- Implementing ADT with C++ classes. Stacks Queues and Linked Lists as cases
- Implementing Trees and Graph and all comparison based sorting algorithms
- Function objects and call backs
- Templates and Generics Stack Queses should be implemented in the practicals
- Extensive coverage of all the three components of STL namely containers, iterators and algorithms throgh suitable pratical caseletts
- Final case study could be an application making extensive handling files.streams classes

PRE-REQUISITES:

- Data Structure Concept
- Real Programming Experience with C Language
- UNIT-III of MCA-102 should be finished before start of Unit-IV of this paper

UNIT – I

Implementing oops concepts in c++ Objects, Classes, Encapsulation, Data Abstraction, Inheritance, Polymorphism, Dynamic Binding, Message Passing, Default Parameter Value, Using Reference variables with Functions.

[No. of Hrs: 09]

UNIT – II
Abstract data types, Class Component, Object & Class, Constructors Default and Copy Constructor, Assignment operator deep and shallow coping, Access modifiers – private, public and protected. Implementing Class Functions within Class declaration or outside the Class declaration. instantiation of objects, Scope resolution operator, Working with Friend Functions, Using Static Class members. Understanding Compile Time Polymorphism function overloading Rules of Operator Overloading (Unary and Binary) as member function/friend function, Implementation of operator overloading of Arithmetic Operators, Overloading Output/Input,
Prefix/ Postfix Increment and decrement Operators, Overloading comparison operators, Assignment, subscript and function call Operator, concepts of namespaces. [No. of Hrs. 10]

UNIT – III
Inheritance: Inheritance, Types of Inheritance, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hierarchies, Overriding inheritance methods, Constructors and Destructor in derived classes. Multiple Inheritance.

Polymorphism: Polymorphism, Type of Polymorphism – compile time and runtime, Understanding Dynamic polymorphism: Pointer to objects, Virtual Functions (concept of VTABLE), pure virtual functions, Abstract Class.

Advanced Input/Output, Exception Handling and Manipulating strings, Using istream / ostream member functions, Using Manipulators, Creating Manipulator Functions, Understanding Implementation of Files, Writing and Reading Objects. Understanding of working and implementation of Exception Handling. [No. of Hrs: 11]

UNIT – IV


TEXT BOOKS:

REFERENCE:
INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVE: The objectives of this course are to:
- Help students become familiar with the fundamental concepts of operating system.
- Help students become competent in recognizing operating systems features and issues.
- Provide students with sufficient understanding of operating system design and how it impacts application systems design and performance.

Upon successful completion of this course, the student shall be able to:
- Exhibit familiarity with the fundamental concepts of operating systems.
- Exhibit competence in recognizing operating systems features and issues.
- Apply a mature understanding of operating system design and how it impacts application systems design and performance.

PRE-REQUISITES:
- Basics of Computer System Architecture
- C/C++ Programming Skills

UNIT – I
Operating System: Introduction, Role, Types of OS; Batch Systems, multi programming, time-sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls.
CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Algorithm Evaluation. [No. of Hrs.:10]

UNIT – II
Interprocess Communication and Synchronization: Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors, Message Passing.
Memory Management: Background, Logical vs. Physical Address space, swapping, Contiguous allocation, Paging, Segmentation, Segmentation with Paging.
Virtual Memory: Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing, Other Considerations, Demand Segmentation. [No. of Hrs: 11]

UNIT – III
Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices; Device Characteristics-Hardware Consideration, Channels and Control Units,
Independent Device Operation, Buffering, Multiple Paths, Block Multiplexing, Device Allocation Consideration

**Secondary-Storage Structure:** Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Reliability.  
[No. of Hrs.: 12]

**UNIT – IV**

**File-System Interface:** File Concept, Access Methods, Directory Structure.


**Security:** The Security problem, Goals of protection, Access matrix, Authentication, Program threats, System threats, Intrusion detection, Cryptography.

**Case Study:** Linux Operating System and Windows XP.  
[No. of Hrs.: 10]

**TEXT BOOKS:**

**REFERENCES:**
INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVES: The purpose of this course is to enable the students know about the fundamental concepts necessary for designing, using and implementing database systems and applications. It also covers advanced techniques and technologies.

PRE-REQUISITE:
- Elementary Maths (Sets, Relations)
- Basic Data Structure Concepts

UNIT - I
Basic concepts: database & database users, characteristics of the database, database systems, concepts and architecture, date models, schemas & instances, DBMS architecture & data independence, database languages & interfaces, data modeling using the entity-relationship approach. Overview of hierarchical, Network & Relational Data Base Management Systems. [No. of Hrs. 9]

UNIT - II
Relational model, languages & systems: relational data model & relational algebra: relational model concepts, relational model constraints, relational algebra, SQL- a relational database language: date definition in SQL, view and queries in SQL, specifying constraints and indexes in sql. [No. of Hrs. 12]

UNIT - III
Oracle Architecture, Logical Data Structures Physical Data Structure, Instances, Table Spaces, Types of Tablespaces, Internal Memory Structure, Background Processes, Data Types, Roles & Privileges, Stored Procedures, User Defined Functions, Cursors, Error Handling, Triggers. [No. of Hrs. 10]

UNIT - IV
Relational data base design: function dependencies & normalization for relational databases: functional dependencies, normal forms based on primary keys, (1NF, 2NF, 3NF & BCNF), lossless join and dependency preserving decomposition. Concurrency control & recovery techniques: concurrency control techniques, locking techniques, time stamp ordering, granularity of data items, recovery techniques: recovery concepts, database backup and recovery from catastrophic failures. Concepts of object oriented database management systems, Distributed Data Base Management Systems. [No. of Hrs. 11]

TEXT BOOKS:
REFERENCES:


INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVE: Course is intended to help students to develop skills that will enable them to construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain. The concept covered in syllabus are

- The software development process.
- Software requirements and specifications.
- Software design techniques.
- Techniques for developing large software systems.
- CASE tools and software development environments.
- Software testing, documentation and maintenance.

PRE-REQUISITE:
- Program Development
- Basic Concepts of Data Management

UNIT-I
Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD & Use case approach, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS, Requirement Management, IEEE Std. for SRS.  [No. of Hrs.: 10]

UNIT-II
Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design.  [No. of Hrs.: 12]

UNIT-III

UNIT-IV

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TEXT BOOKS:

REFERENCES:
There will be following Practical:

1. Data and File Structure Lab                      MCA 152
2. Object Oriented Programming in C++ Lab        MCA 154
3. Database Management System Lab               MCA 156
4. Software Engineering Lab                      MCA 158
Code No. : MCA 162
Paper: General Proficiency – II*

It is suggested to have a fundamental course on Personality Development and Communication Skills – II in this semester.

This paper is under Non University Examination system its detail content will be decided by the respective Institute, under approval of the coordination committee based on the requirement of individual institution.

*Non University Examination Scheme (NUES)

There will not be any external examination of the university. The performance of the candidates should continuously be evaluated by an internal committee. The committee may conduct viva-voce at the end for the award of the marks.
INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVES:
This course is extensive and theoretical treatment of issues in Computability and Complexity; Topics include Automata and Language Theory, Computability Theory, and Complexity Theory. Learning outcome of this course will be theoretical treatment of following
- What can be computed and how fast it can be done?
  - Use of Automata and Language theory in the development of different modules of a compiler as a case study.

PRE-REQUISITE:
- Discrete Mathematics
- Skills in writing Formal Mathematical Proofs

UNIT - I
Automata and Language Theory: Overview of Theoretical Computer Science (including computationally intractable problems), Introduction to System software including various phases / Modules in the design of a typical compiler, Chomsky Classification, Finite Automata, Deterministic Finite Automata (DFA), Non-Deterministic Finite Automata (NFA), statement of Kleen's Theorem, Regular Expressions, Equivalence of DFAs, NFAs and Regular Expressions, Closure properties of Regular Language, Non-Regular Languages, Pumping Lemma. Myhill Nerode Theorem, Use of Regular expressions in the Design of scanner (lexical analyzer). Introduction to JFLAP Simulation.
[No. of Hr: 12]

UNIT - II
Context Free Languages: Context Free Grammar (CFG), Parse Trees, Push Down Automata (deterministic and nondeterministic) (PDA), Equivalence of CFGs and PDAs, Closure properties of CFLs, Pumping Lemma, Parsing (including LL(1), SLR and LR(1) Parsing Method).
[No. of Hr.: 12]

UNIT - III
Turing Machines and Computability Theory: Definition of Turing Machine, Extensions of Turing machines, Non-deterministic Turing machines, Equivalence of various Turing Machine Formalisms, Church – Turing Thesis, Decidability, Halting Problem, Reducibility, Recursion Theorem.
[No. of Hr: 10]

UNIT - IV
Complexity Theory: Time and Space measures, Hierarchy theorems, Complexity classes P, NP, space complexity, Savich theorem, L, NL, PSPACE complexity, Post correspondence problem, Probabilistic computation.
[No. of Hr: 6]

TEXT BOOKS:

REFERENCES:
**Code No. MCA 203**
**Paper: Computer Graphics**

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**INSTRUCTIONS TO PAPER SETTERS:**

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

**OBJECTIVES:** Computer graphics is used in diverse applications from the visualization of complex scientific data to the special effects in computer games. The objective of this course is to introduce the programming principles of computer graphics. The course will cover Practical programming through C, and mathematical and theoretical foundations.

**PRE-REQUISITE:**
- Mathematical Concepts

**UNIT-I**

**Scan conversion:** Scan converting a point, line (Bresenham’s, DDA), 2-D transformations (Rotation, Rotation about an arbitrary line, Scaling, Translation, Shearing, Reflection, and Reflection about an arbitrary line), circle and ellipse.

**Transformation:** 2D transformation, Basic Transformation, Various 2D and 3D Transformation matrices (Translation, Rotation, Scaling, Shearing and Reflection), Composite transformations: Reflection, Shearing and Transformation between coordinate Systems. Rotation about : (i) an arbitrary axis (ii) about an arbitrary point.  

[No. of Hrs: 10]

**UNIT-II**

**Curves and Surfaces** Bezier Curves, 4 point and 5 point Bezier curves using Bernstein Polynomials, Conditions for smoothly joining curve segments, Bezier bi-cubic surface patch, B-Spline Curves, Cubic B-Spline curves using uniform knot vectors, first and second order continuities, Effect of multiple control points at same location, Geometrical Construction, Computing control points given end slopes for a specified curve segment.  

[No. of Hrs: 10]

**UNIT-III**

**Transformations:** 3-D Transformation, Computing location of V.P, 2-D viewing, Window-to-view port transformation

**Clipping:** Line Clipping; Sutherland Cohen clipping algorithms, Sutherland-Hodgement.

**Projection:** Parallel and Perspective Projections

**Solid Modeling:** Sweeping a polygon or a surface patch along a path to form solids, Boundary Representation (B-Rep), octrees, CSG – Constructive Solid Geometry.  

[No. of Hrs: 10]

**UNIT-IV**

**Shading:** Shading, Illumination Model for diffused Reflection, Effect of ambient lighting & distances, Specular Reflection Model, Computing Reflection Vector, Curved Surfaces, Polygonal Approximations, Gourard Shading, Phong Model.


[No. of Hrs: 12]
TEXT BOOKS:

REFERENCES:
OBJECTIVE: In this course student will become familiar with features of Java language, they will learn how to write Java code according to Object-Oriented Programming principles, how to design GUI applications and Applets using AWT, how to develop multithreaded and Networking applications and how to create dynamic pages.

PRE-REQUISITES:

- Basic Object Oriented Programming Concepts

UNIT – I
Importance and features of Java, Language Construct of java including Keywords, constants, variables and looping and decision making construct, Classes and their implementation, Introduction to JVM and its architecture including set of instructions. Overview of JVM Programming . Internal and detailed explanation of a valid .class file format. Instrumentation of a .class file, Byte code engineering libraries, Overview of class loaders and Sandbox model of security.

Introducing classes, objects and methods: defining a class, adding variables and methods, creating objects, constructors, class inheritance. Arrays and String: Creating an array, one and two dimensional arrays, string array and methods, Classes: String and String Buffer classes, Wrapper classes: Basics types, using super, Multilevel hierarchy abstract and final classes, Object class, Packages and interfaces, Access protection, Extending Interfaces, packages.

[No. of Hrs.: 12]

UNIT – II
Exception Handling: Fundamentals exception types, uncaught exceptions, throw, throw, final, built in exception, creating your own exceptions,

Multithreaded Programming: Fundamentals, Java thread model: priorities, synchronization, messaging, thread classes, Runnable interface, inter thread Communication, suspending, resuming and stopping threads.

Input/Output Programming: Basics, Streams, Byte and Character Stream, predefined streams, Reading and writing from console and files.


[No. of Hrs.: 10]

UNIT – III
Event Handling: Different Mechanism, the Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter and Inner Classes, Working with windows, Graphics and Text, using AWT controls, Layout managers and menus, handling Image, animation, sound and video, Java Applet.

The Collection Framework: The Collection Interface, Collection Classes, Working with Maps & Sets
**JDBC:** Introduction to DBMS & RDBMS, DBC API, JDBC Application Architecture, Obtaining a Connection, JDBC Models: Two Tier and Three Tier Model, ResultSet, Prepared Statement, Callable Statement.

[No. of Hrs: 09]

**UNIT – IV**

**RMI (Remote Method Invocation):** Introduction, Steps in creating a Remote Object, Generating Stub & Skeleton, RMI Architecture, RMI packages.

**Java Bean:** Introduction, Bean Architecture, Using the Bean Development Kit, Creating simple bean-properties, methods and events, Packing beans- the manifest & the jar, Java bean package, Introduction to NetBean.

**Swing:** Introduction to JFC (Java Foundation Classes), Features of Swing, Comparison with AWT, Advanced Control.

[No. of Hrs.: 11]

**TEXT BOOKS:**


**REFERENCES:**

OBJECTIVE:
This course covers theory and practice of data communication between computing devices. Topics include network architecture and topology, Basics of networking and protocols, OSI network layered models and Application layer protocols.

PRE-REQUISITE:
• Basic Networking
• Operating System Concepts

UNIT - I
Introductory Concepts: Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology.

UNIT - II

UNIT - III
Network Layer: Point-to-Point network, routing algorithms, congestion control, internetworking, Quality Control, Internetworking, The Network Layer in the Internet, IP packet, IP addresses, IPv6.

UNIT - IV
TEXT BOOKS:
4. Comer, “Computer Networks and Internet”, PHI.
5. Comer, “Internetworking with TCP/IP”, PHI.

REFERENCES:
OBJECTIVE: In this course student will become familiar with an with C# language. This course will help to develop real life projects.

PREREQUISITES:
- Basic Programming Language

UNIT - I
The CLR and .NET Framework: Understand the motivation behind the .NET platform, Common Language Infrastructure (CLI). Know the role of the Common Type System (CTS), the Common Language Specification (CLS) and the Common Language Runtime (CLR), Understand the assembly, metadata, namespace, type distinction, Contrast single-file and multi-file assemblies, Know the role of the Common Intermediate Language (CIL), Platform independent .NET(Mono / Portable .NET distributions).

UNIT - II
Evolution of C# Language: Language Fundamentals, Reference and value Types, primitive types the Nullable and enum types, Classes and objects, Defining classes Creating objects, Using static members, Garbage Collector, Overloading Methods, Various Constructors. Encapsulating data, access modifiers, properties, indexers arrays and readonly fields. Handling errors and throwing exceptions The Root object class. Inheritance and polymorphism specialization and generalization, Abstract classes, nesting of classes. Structures. String and DateTime classes.

UNIT - III
Event handling paradigm Delegates and events. Anonymous delegates and lambda expression FUNC and Action delegates.
Programming Window Forms Applications: The notifies - subscribers paradigm for handling events. .NET framework for handling GUI events. Introduction to WPF and building an WPF application

UNIT - IV
Introducing LINQ and XML: XML A quick introduction. LINQ and C#. Defining and executing a Query. Implicitly typed local variables. Anonymous Types, Extension Methods and Lambda Expressions. Putting LINQ to work. LINQ to SQL Fundamentals of ADO.NET Updating retrieving and deleting data using LINQ to SQL.
TEXT BOOKS:
1. Jesse Liberty and Donald Xie, “Programming C# 3.0”, O’REILLY.
4. Joseph Albahari and Ben Albhari, “C# 3.0/4.0 in NUTSHELL”, O’REILLY.

REFERENCES:
2. Jon Skeet, “C# in Depth”, O’REILLY
Practical will be based on following:

1. Computer Graphics Lab  
   MCA 251
2. Java Programming Lab  
   MCA 253
3. C# Lab  
   MCA 255
Code No. : MCA 261  
Paper: General Proficiency – III*

It is suggested to have a fundamental course on Technical Paper Writing in this semester.

This paper is under Non University Examination system its detail content will be decided by the respective Institute, under approval of the coordination committee based on the requirement of individual institution.

*Non University Examination Scheme (NUES)

There will not be any external examination of the university. The performance of the candidates should continuously be evaluated by an internal committee. The committee may conduct viva-voce at the end for the award of the marks.
OBJECTIVE: In this course, students will learn how:

- To design new algorithms based on standard algorithm-design strategies.
- To analyze the time and space usage and correctness of new algorithms based on standard algorithm-analysis techniques.
- To apply and adapt fundamental algorithms (sorting, searching, order statistics, graph algorithms) to new situations.
- To solve problems and to express your solutions using the language and concepts of algorithms and its mathematical tools.

PRE-REQUISITES

- Programming in C
- Data Structure in C
- Discrete Mathematics

UNIT - I

[No of Hrs.: 10]

UNIT - II

[No of Hrs.: 10]

UNIT - III:
Greedy Techniques, Prim’s Algorithm, Kruskal’s Algorithm , Dijkstra’s and Bellman Ford Algorithm , Huffman trees. Knapsack Problem , Dynamic Programming paradigm , Warshall ’s and Floyd’s Algorithm , Optimal Binary Search trees , Matrix multiplication Problem , 0/1 Knapsack Problem , maximum network flow problem , naive string matching algorithm , string matching with finite automata Knuth morris Pratt algorithm , The Rabin-Karp Algorithm.

[No of Hrs.: 10]

UNIT - IV

[No of Hrs.: 10]
TEXT BOOKS

REFERENCES:
OBJECTIVES: This course is an attempt to provide you with the basic information about data warehouse and their development. This course also provides the basic conceptual background necessary to design and develop data warehouse applications.

PRE-REQUISITE:
- Information System Concepts

UNIT- I
The Compelling Need for data warehousing: Escalating Need for strategic information, failures of Past decision-support systems, operational versus decision-support systems, data warehousing – the only viable solution, data warehouse defined Data warehouse – The building Blocks: Defining Features, data warehouses and data marts, overview of the components, metadata in the data warehouse Defining the business requirements: Dimensional analysis, OLAP operations : Drill-down and roll-up, slice-and-dice or rotation.

[No. of Hrs: 11]

UNIT- II
Principles of dimensional modeling: , the STAR schema, STAR Schema Keys, Advantages of the STAR Schema Dimensional Modeling: Updates to the Dimension tables, miscellaneous dimensions, the snowflake schema, aggregate fact tables, families of STARS ,Steps for the Design & Construction of Data warehouse : Framework , Architecture , Type of OLAP Servers : ROLAP , MOLAP , Data warehouse implementation tolls & techniques.

[No. of Hrs.: 10]

UNIT- III
Data Mining, Data Mining of what kind of Data , Knowledge discovery process (KDD) , What kind of patterns can be mined , OLAP versus data mining, data mining and the data warehouse, Data mining functionalities, classification Systems , Data processing : Cleaning , Integration & transformation, Reduction . Data Mining primitives: What defines a Data Mining Task.

[No. of Hrs.: 10]

UNIT- IV
Data Mining Query language (DMQL), Cluster Analysis : Partitioning , Hierarchical Density , Grid & Model based methods , Major Data Mining Techniques, Cluster detection, decision trees, memory-based reasoning, link analysis, neural networks, genetic algorithms, moving into data mining, Data Mining Applications, Benefits of data mining & applications.

[No. of Hrs.: 11]
TEXT BOOKS:

REFERENCES:
INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVE:

- To grasp the current directions of computer networks research.
- To fill in gaps in students’ networking knowledge.
- To better understand experimental methodology.

PREREQUISITE:

- Data Communications and Networking

UNIT - I
Introduction: Overview of computer network, seven-layer architecture, TCP/IP suite of protocol, etc, Mac protocol for high speed LANS, MAN’s & WIRELESS LANs (for example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet etc) Fast access technologies (For example, ADSL, cable Modem Etc.), Wi-Fi, WiMAX.

[No. of hrs: 10]

UNIT – II
IPV6: Why IPV6, basic protocol, extension & option, support for QS, Security, etc, neighbor discover, auto-configuration, routing, Change to other protocols, Application programming interface for IPV6.6 bone. ATM: Introduction, ATM reference Model, AAL layers, AAL0, AAL1, AAL2, AAL3/4, AAL5

[No. of hrs: 12]

UNIT – III
Mobility in network, mobile, Security related issues. IP Multicasting: Multicasting routing protocols, address assignment, session discovery, etc.

[No. of hrs: 10]

UNIT-IV
TCP extensions for high-speed networks, transaction-oriented application, other new option in TCP. Network security at various layers: Secure-HTTP, SSP, ESP, Authentication header, key distribution protocols, Digital signatures, digital certificates.

[No. of hrs: 10]

TEXT BOOKS:


REFERENCES:

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVE: The objective of the course is to give students a detailed understanding of processes and techniques for building large object-oriented software systems. To develop skills to evolve object-oriented systems from analysis, to design, to implement and to understand most of the major object-oriented technologies including basic OO concepts, processes, languages, databases, user interfaces, frameworks, and design patterns.

PRE-REQUISITE:
- Software Engineering Concepts
- Object Oriented Programming Concepts

UNIT - I
Review of Object modeling, new paradigm, object oriented thinking-rethinking, Objects and Classes. Links and association, Generalization and specialization, Inheritance, Grouping concepts, aggregation, composition , abstracts classes, Polymorphism, Metadata, Constraints, Reuse.
Object Oriented Lifecycle Model, Introduction to Object Oriented Methodology, Overview of various object oriented methodologies- OOD, HOOD, OMT, CRC, OOA, OOSA, OOSE, OOSD, OORASS.
[No. of Hrs.: 12]

UNIT - II
Architecture: Introduction, System development is model building, model architecture, requirements model, analysis model, the design model, the implementation model, test model.
Analysis: Introduction, the requirements model, the analysis model.  
[No. of Hrs.: 09]

UNIT - III
Construction: Introduction, the design model, block design, working with construction.
Testing: introduction, on testing, unit testing, integration testing, system testing, the testing process. 
[No. of Hrs.: 09]

UNIT - IV
Case Studies. 
[No. of Hrs.: 12]

TEXT BOOKS:

REFERENCES:
INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVE: In this course student will learn how to design and develop a dynamic website. This course also provides some basic knowledge of web services which are useful for the same.

PRE-REQUISITE:
- Web Designing Tools
- Object-Orientated Paradigm
- Concept of a Namespace

UNIT-I
Overview of Internet and web, HTML Tags, Forms & Frames, Introduction to Java Script and Cascading Style Sheets, DHTML, Using various Web Design Tools like Dream Weaver, Gif Animator etc

[No. of Hrs 10]

UNIT-II
ASP.Net, Working with ASP.Net Web Forms: Building ASP.Net Page, Building Forms with Web Server Controls, Performing Form Validation with Validation Control, Advanced Control Programming. Working with ADO.Net: Introduction to ADO.Net, Binding Data to web Control, Using the DataList and DataGrid Controls, Working with DataSets, Working with XML.

[No. of Hrs 10]

UNIT-III

[No. of Hrs 10]

UNIT-IV

[No. of Hrs 12]

TEXT BOOKS:

REFERENCES:
1. Raj Kamal, “Internet and Web Technologies”, TMH.
2. Deitel, “Internet & World Wide Web, How to Program”, PHI.
7. Ivan Bay Ross, “HTML, DHTML, Java script, Perl CGI”, BPB.
Practical will be based on following:

1. Design and Analysis of Algorithm Lab  
   MCA 252
2. Data Warehousing and Data Mining Lab  
   MCA 254
3. Advance Computer Networks Lab  
   MCA 256
4. Object Oriented Analysis and Design  
   MCA 258
5. Web Technologies Lab  
   MCA 260
Code No. : MCA 262  
Paper: General Proficiency – IV*

It is suggested to have a fundamental course on Process Modeling (Management Oriented) in this semester.

This paper is under Non University Examination system its detail content will be decided by the respective Institute, under approval of the coordination committee based on the requirement of individual institution.

*Non University Examination Scheme (NUES)

There will not be any external examination of the university. The performance of the candidates should continuously be evaluated by an internal committee. The committee may conduct viva-voce at the end for the award of the marks.
INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVES: The main objective of this course is to provide Students
- A comprehensive overview of the Linux operating system along with Shell commands and shell scripting
- Implementation of Linux System programmes through GCC compiler.
- Understanding of basic concept of Socket programming (TCP and UDP)

PRE-REQUISITE:
- Operating system
- Computer Network
- C /C++ Programming

UNIT – I
[No. of Hrs.: 10]

UNIT – II
Resource Management in Linux: file and directory management, system calls for files Process Management, Signals, IPC: Pipes, FIFOs, System V IPC, Message Queues, system calls for processes, Memory Management, library and system calls for memory.
[No. of Hrs.: 10]

UNIT – III
Shell Programming: Available shells under Linux (viz. Bash, TCSH, Korn or so on), different Shell features, editors, shell commands, shell scripts: shell variables, environmental variables, purpose of shell scripts, writing, storing and executing scripts, Filters- The grep family, advanced filters-sed and awk.
[No. of Hrs.: 10]

UNIT – IV
[No. of Hrs.: 10]

TEXT BOOKS:
REFERENCES:
11. Tammy Fox, “Red Hat Enterprise Linux 5.0 Administrator Unleashed”, SAMS.
OBJECTIVE: At the end of this course the student will be able to:

- Appreciate the fundamentals of software testing and its application through the software life cycle.
- Develop skills in designing and executing software tests suitable for different stages in the software life cycle.
- Understand and appreciate the role of software testing in systems development, deployment and maintenance.
- Develop a continuing interest in software testing, and obtain satisfaction from its study and practice.
- Appreciate the responsibilities of software testers within software projects, the profession and the wider community.

PRE-REQUISITE:

- Software Engineering Concepts

UNIT - I


[No. of Hrs.: 08]

UNIT - II
Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.


[No. of Hrs.: 10]

UNIT - III

Selection, Minimization, Prioritization of test cases for Regression Testing: Regression Testing, Regression Test Case Selection, Prioritization guidelines, Priority category Scheme, Code Coverage Techniques for Prioritization of Test Cases, Risk Analysis.

[No. of Hrs.: 12]

UNIT - IV
**Object Oriented Testing:** Issues in Object Oriented Testing, Path testing, Class Testing, state based testing, Object Oriented Integration and System Testing.

**Metrics and Models in Software Testing:** What are Software Metrics, categories of Metrics, object Oriented Metrics used in testing, What should we measure during testing?, Software Quality Attributes.

**Prediction Model:** Reliability Modes, Fault Prediction Model.  

[No. of Hrs.: 12]

**TEXT BOOKS:**

**REFERENCES:**
OBJECTIVE: In this course student will learn about J2EE technology and will be able to develop dynamic websites. This course will explain how Enterprise JavaBeans (EJBs) contain the application's business logic and business data.

PRE-REQUISITES:
- Core JAVA

UNIT I
Introduction to J2EE and building J2EE applications, MVC architecture, Introduction to servlets and it’s life cycle, problems with cgi-perl interface, generic and http servlet, servlet configuration, various session tracking techniques, servlet context, servlet configuration, servlet collaboration.

[No. of Hrs.: 10 Hrs]

UNIT II

[No. of Hrs.: 12 Hrs]

UNIT III
EJB fundamentals: Motivation for EJB, EJB Echo system, J2EE technologies, Enterprise beans and types, distributed objects and middleware, developing EJB components, remote local and home interface, bean class and deployment descriptor.

[No. of Hrs.: 10 Hrs]

UNIT IV
Introducing session beans: Session beans life time, statefull and Stateless session beans beans, lifecycle of session beans. Introducing Entity beans: persistence concepts, features of entity beans, entity context, Introduction to JMS & Message driven beans.

[No. of Hrs.: 10 Hrs]

TEXT BOOKS:
REFERENCES:

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVES: This course is an attempt to provide you with the advanced information about database management system and their development. This course also provides the conceptual background necessary to design and develop distributed database system for real life applications.

PRE-REQUISITE:
- Centralized Database Management System Concepts

UNIT -I
Review of traditional DBMS’s, relational algebra and relational calculus, design principles, normalization, transaction and concurrency control, recovery management. [No. of Hrs.: 10]

UNIT -II
Design Process: Design process, design evaluation, modeling process, E-R model, and semantic data model, object oriented model, models and mapping normalization and denormalization. Data warehousing, OLAP and data mining. [No. of Hrs.: 12]

UNIT -III
Architecture: Architecture of SQL server, SQL server and Oracle server tuning, SQL server tuning, Oracle server tuning, OS tuning (Microsoft OS’s). [No. of Hrs.; 08]

UNIT-IV
Distributed Database Management Systems, Components, levels of data & process distribution, transparency features, data fragmentation, data replication, Client Server Systems, Principles, components, ODBC, ADO, JDBC and JSQL overview. [No. of Hrs.: 12]

TEXT BOOKS:
1. C. J. Date, “Introduction to Database Systems”, AWL.

REFERENCES:
1. DB2, Oracle & SQL Server Documentation.
OBJECTIVES: This course responds to the needs of the engineering and physical sciences curricula by providing an applications-oriented introduction to numerical methods/analysis. Rather than a pure discussion and analysis of methods, we shall often integrate a discussion of the properties of engineering and physical problems with the discussion of methods by which such problems may be solved numerically. This approach is more “natural” and more like the one students actually follow when applying numerical methods within their areas of interest.

PRE-REQUISITE:
• Basic of Mathematics

UNIT - I
[No. of Hrs.: 10]

UNIT - II
[No. of Hrs.: 10]

UNIT - III
[No. of Hrs.: 12]

UNIT - IV
Difference of Means, Proportions. Chi-square Test for best fit. [No. of Hrs.: 10]

TEXT BOOKS:

REFERENCES:
5. Francis Scheld, “Numerical Analysis”, TMH.
OBJECTIVE: Software Project Management provides insight to the importance of careful project management. Topics are presented in the same order that they appear in the progression of actual projects and covers the following concepts.
The course will introduce and develop the concepts that are seen as central to the effective management of software projects.
Basic measurements are presented with examples from real-world projects, which show how a project can be monitored, controlled and assessed.

PRE-REQUISITE:
• Software Engineering Concepts
• Academic Project

UNIT - I
Introduction: Introduction to software project management and control. Whether software projects are different from other types of projects. The scope of project management. The management of project life cycle. Defining effective project objectives where there are multiple stakeholders. Software Tools for Project Management.

UNIT - II
Project Scheduling: Time Management, Project Network Diagram, Critical path Analysis, PERT, Use of Software (Microsoft Project) to Assist in Project Scheduling.

UNIT - III
Project Quality Management: Stages, Quality Planning, Quality Assurance, Quality Control, Quality Standards, Tools and Techniques for Quality Control.

UNIT - IV
Project Risk Management: Common Sources of Risk in IT projects, Risk Identification, Risk Quantification, Risk Response Development and Control.

UNIT Procurement Management: Procurement Planning, Solicitation, Source Selection, Contract Administration.

Introduction to Project Management Process Groups, Project Controlling and Configuration.
TEXT BOOKS:

REFERENCES:
INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVES: As technology advances and hardware and software improves, it becomes much more feasible to integrate multimedia directly into classroom activities and the core curriculum. Understanding why, when, and where multimedia is appropriate and beneficial is the first step toward successful implementation.

- To study the graphics techniques and algorithms.
- To study the multimedia concepts and various I/O technologies.
- To enable the students to develop their creativity

PRE-REQUISITE:

- Multimedia Application

UNIT – I
Introductory Concepts: Multimedia – Definitions, CD-ROM and the Multimedia Highway, Uses of Multimedia, Introduction to making multimedia – The Stages of project, the requirements to make good multimedia, Multimedia skills and training, Training opportunities in Multimedia. Multimedia-Hardware and Software: Multimedia Hardware – Macintosh and Windows production Platforms, Hardware peripherals – Connections, Memory and storage devices, Media software – Basic tools, making instant multimedia, Multimedia software and Authoring tools. [No. of Hrs.: 10]

UNIT – II
Multimedia – making it work – multimedia building blocks – Text, Sound, Images, Animation and Video, Digitization of Audio and Video objects, Data Compression: Different algorithms concern to text, audio, video and images etc., Working Exposure on Tools like MAYA. [No. of Hrs.: 16]

UNIT – III

UNIT – IV
Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Assembling and delivering a project-planning and costing, Designing and Producing, content and talent, Delivering, CD-ROM technology. [No. of Hrs.: 08]

TEXT BOOKS:

REFERENCES:
INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVE: This course will cover a broad selection of topics in data communications, resource management, network protocols, distributed computing, information management, user interfaces, applications/services, and security. Students will learn the principles of Mobile Computing and its enabling technologies, and explore a young but rich body of exciting ideas, solutions, and paradigm shifts.

PRE-REQUISITE:
• Operating Systems
• Networking
• Distributed Computing
• Programming skill in C/C++

UNIT - I

UNIT – II
Data management issues: mobility, wireless communication and portability, data replication Schemes , basic concept of multihopping, Adaptive Clustering for mobile Network , Multicluster Architecture. [No. of Hrs.: 10]

UNIT – III
Location Management: Introduction, Location Based Services , Automatically Locating Mobile Users, Locating and Organizing Services, Is Use and future directions, mobile IP, Comparison of TCP wireless. [No. of Hrs.: 10]

UNIT - IV
Transaction management: Introduction, Data Dissemination, Cache Consistency, Mobile transaction processing, mobile database research directions, Security fault tolerance for mobile N/W. [No. of Hrs.: 10]

TEXT BOOKS:

REFERENCES:
1. C. K. TOH, “Mobile Adhoc Networks”, TMH.
INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVE: This course covers the issues and techniques involved in the creation of computer systems that engage in intelligent behaviour. Students will explore problem-solving paradigms, logic and theorem proving, search and control methods, and learning.

Learning outcome of this course is

- Introducing students to the basic concepts and techniques of Artificial Intelligence.
- Learning AI by doing it, i.e. developing skills of using AI algorithms for solving Practical problems.

PRE-REQUISITES:

- Discrete Mathematic
- Analysis of Algorithms

UNIT - I

[No. of Hrs.: 10]

UNIT - II

[No. of Hrs.: 12]

UNIT - III
First order logic – representation revisited – Syntax and semantics for first order logic – Using first order logic – Knowledge engineering in first order logic - Inference in First order logic – prepositional versus first order logic – unification and lifting – forward chaining – backward chaining - Resolution – Knowledge representation - Ontological Engineering - Categories and objects – Actions - Simulation and events - Mental events and mental objects.

[No. of Hrs.: 10]

UNIT - IV

[No. of Hrs.: 10]
TEXT BOOK:

REFERENCES:
OBJECTIVE: The objective of this course is to introduce students to features and technology of microprocessor systems. Gain experience in assembly language programming of microprocessor peripherals and interrupt service routines, as well as data processing tasks. At the end of the course the student should:

- Know basics of microprocessor-based Systems.
- Know basics of assembly language.
- Know the process of compilation from high level language to assembly language to machine language.
- Know interaction between hardware and software, i.e. 'interfacing'.

PRE-REQUISITE:

- Digital Systems Fundamentals
- Assembly Language Programming
- Electronics

UNIT – I
Computer Number Systems, Codes, and Digital Devices: Computer Number Systems and Codes, Microprocessor Evolution and Types, the 8086 microprocessor family-overview, 8086 internal architecture, introduction to programming the 8086, addressing modes of 8086. 8086 Family Assembly Language Programming: Program Development Steps, Constructing the machine codes for 8086 instructions, writing programs for use with an assembler, assembly language program development tools. [No. of Hrs.: 10]

UNIT – II
Implementing Standard Program Structures in 8086 Assembly Language: Simple Sequence Programs, Jumps, Flags, and Conditional Jumps, If-Then, if-then-else, and multiple if-then else programs, while-do programs, while-do programs, repeat-until programs, instruction timing and delay loops Strings, Procedures, and macros: the 8086 string instructions, writing and using procedures, writing and using assembler macros 8086 Instruction Descriptions and Assembler Directives. [No. of Hrs.: 11]

UNIT – III

UNIT – IV
Interfacing 8086 with 8255, 8254, 8259, 8253, 8251, 8259, 8279.
Brief Introduction to Architecture of 80186, 80286, 80386, 80486, 8087 and Pentium architecture. [No. of Hrs.: 10]

TEXT BOOKS:

REFERENCES:
OBJECTIVES: This course develops the mathematical basis for syntax specification and translation and shows how this basis can be used to design and implement compilers. Learning outcomes of this course are:

- To stimulate deeper learning of algorithms and data structures by practicing compiler writing algorithm.
- To develop Skills to use Tools like Lex and YACC in writing scanners and parsers.
- To develop a cross-compiler.

PRE-REQUISITES

- Programming Language
- Theory of Computation
- Design and Analysis of Algorithms
- Computer Organization

UNIT - I
Compiler Structure: Analysis-synthesis model of compilation, various phases of a compiler, tool based approach to compiler construction. Lexical analysis: Interface with input parser and symbol table, token, lexeme and patterns, difficulties in lexical analysis, error reporting and implementation. Regular grammar & language definition, Transition diagrams, design of a typical scanner using LEX or Flex.  

[No. of Hrs.: 10]

UNIT - II
Syntax Analysis: Context free grammars, ambiguity, associability, precedence, top down parsing, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing LL(1) grammar, Nor LL(1) grammar, Bottom up parsing, operator precedence grammars, LR parsers (SLR, LALR, LR), Design of a typical parser using YACC or Bison.  

[No. of Hrs.: 10]

UNIT - III
Syntax directed definitions: Inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions. Type checking: type: type system, type expressions, structural and name equivalence of types, type conversion, overloaded function and operators, polymorphic function. Run time system: storage organization, activation tree, activation record, parameter passing symbol table, dynamic storage allocation. Intermediate code generation: intermediate representation, translation of declarations, assignments, Intermediate Code generation for control flow, Boolean expressions and procedure calls, implementation issues.  

[No. of Hrs.: 12]
UNIT - IV
Code generation and instruction selection: Issues, basic blocks and flow graphs, register allocation, code generation, DAG representation of programs, code generation from DAGS, peep hole optimization, code generator generators, specification of machine.
Code optimization: source of optimizations, optimization of basic blocks, loops, global dataflow analysis, solution to iterative dataflow equations, code improving transformations, dealing with aliases, data flow analysis of structured flow graphs.  

[No. of Hrs: 10]

TEXT BOOKS:

REFERENCES:
OBJECTIVES: This course is to equip students with the ability of conceptualization of real life systems in the form of mathematical models. Learning Outcome of this course are:

- Understanding of Principles of model building and basic optimization concepts.
- To Develop skills to deploy these concepts in diverse fields of application in manufacturing/service/distribution systems.

PRE-REQUISITES:
- Design and Analysis of Algorithms
- Programming Language

UNIT-I

[No. of Hrs: 11]

UNIT-II
Job-sequencing Models: Sequencing problems, Johnson’s algorithm for processing \( n \) jobs on two machines and \( n \) jobs on three machines, Processing 2 jobs on \( n \) machines using graphical method. Review of Network models, minimal spanning tree algorithm, and shortest route problems: Dijkstra’s algorithm, Maximal flow model, maximal flow algorithm, min-cut, min-cut Max-flow theorem.

[No. of Hrs: 11]

UNIT-III

[No. of Hrs: 10]

UNIT-IV
Queuing systems, Elements of queuing model, role of exponential distribution, birth and death models, steady state measures of performance, single server models, multiple-server models, machine servicing model, Pollaczek-Khintchine formula, queuing decision models. Multi criteria Decision making, Introduction to Game theory, Zero-sum Game.

[No. of Hrs: 10]

TEXT BOOKS:

REFERENCES:
OBJECTIV: An in-depth study of design and implementation issues in distributed database systems, together with a coverage of Database distribution architectures, Distributed query processing, Distributed query optimization, Distributed transaction management, Distributed concurrency control, Distributed reliability protocols and Multi-database systems.

PRE-REQUISITE

- Database Management System
- Distributed Systems

UNIT – I
Distributed DBMS features and needs, Reference Architecture, Levels of Distribution Transparency, Replication, Distributed database design – Fragmentation, allocation criteria, Storage mechanisms, Translation of Global Queries / Global Query Optimization, Query Execution and access plan.  

[No. of Hrs.: 12]

UNIT – II
Concurrency control – 2 phase locks, distributed deadlocks, time based and quorum based protocols, comparison reliability – non-blocking commitment protocols, Partitioned networks, Check points and Cold starts.  

[No. of Hrs.: 10]

UNIT – III
Management of Distributed Transactions – 2 phase unit protocols, Architectural aspects, Node and link failure recoveries, Distributed data dictionary management, Distributed database administration.  

[No. of Hrs.: 10]

UNIT – IV
Heterogeneous database-federated database, reference architecture, loosely and tightly coupled, Alternative architectures, Development tasks, operation – global task management, Client server databases – SQL server, Open database connectivity, Constructing an Application.

Advance Database Concept:
Object Oriented Databases Introduction, Advantages and Disadvantages, Spatial Databases, Multimedia Databases, Deductive Databases, Temporal Databases.  

[No. of Hrs.: 10]

TEXT BOOKS:

REFERENCES:
OBJECTIVE: Any organization that deals with money or money's worth needs to record every transaction that it enters into. The courses in this product give a complete understanding, right from scratch to preparation and analysis of financial statements. The product is supplemented with a number of interactive exercises, in accordance with the 'learn by doing' approach.

After completing this course you will be conversant with:

- Accounting Concepts.
- Accounting Equation.
- Rules of Accounting.
- Recording the transactions.
- Adjusting & Rectifying the books.
- Preparation of Financial Statements.
- Analyzing Financial Statements.
- Reconciling the books.

PRE-REQUISITE:

- Mathematical Concepts

UNIT - I

Meaning and Scope of Accounting: Need for Accounting, Definition and Functions of Accounting, Book Keeping and Accounting, Is Accounting Science or Art? End User of Accounting Information, Accounting and other Disciplines, Role of Accountant, Branches of Accounting, Difference between Management Accounting and Financial Accounting

Meaning of Accounting Principles: Accounting Concepts, Accounting Conventions, Introduction to Accounting Standards, Systems of Book Keeping, Systems of Accounting

Journalising Transactions: Journal, Rules of Debit and Credit, Compound Journal Entry, Opening Entry

Ledger Posting and Trial Balance: Ledger, Posting, Relationship between Journal and Ledger, Rules Regarding Posting, Trial Balance


Capital and Revenue: Classification of Income, Classification of Expenditure, Classification of Receipts

Rectification of Errors: Classification of Errors, Location of Errors, Suspense Account, Rectifying Accounting Entries, Effect on Profit

[No. of Hrs: 12]

UNIT – II

Depreciation Provisions and Reserves: Concept of Depreciation, Causes of Depreciation, Basic Features of Depreciation, Meaning of Depreciation Accounting, Objectives of Providing Depreciation, Fixation of Depreciation Amount, Methods of Recording and Providing Depreciation, AS-6(Revised) Depreciation Accounting
Final Accounts: Manufacturing Account, Trading Account, Profit and Loss Account, Balance Sheet, Simple Adjustment Entries  

UNIT – III  
Inventory Valuation: Meaning of Inventory, Objectives of Inventory Valuation, Inventory Systems, Methods of Valuation of Inventories  
Accounting Standard 2 (Revised): Valuation of Inventories  
Accounts of Non-profit Making Organizations: Receipts and Payments Account, Income and Expenditure Account, Balance Sheet, Items Peculiar to Non-trading Concerns  

UNIT – IV  
Company Final Accounts: Familiarity with the requirements of Schedule VI to the Companies Act 1956, Elementary Knowledge about Items in the Profit & Loss Account and Balance Sheet of a Company, (Preparation of Company Final Accounts not required)  

TEXT BOOKS:  

REFERENCES:  
OBJECTIVE: Effective management of Human Resources is one of the prerequisites of a successful organization, especially in the present day context of an evolving changing and competitive environment. Organizational effectiveness depends largely on its ability to manage the human behavior. A proper understanding of organizational dynamics and the various management concepts is essential for every manager. The objective of this paper is to provide understanding to the participants in understanding, predicting, and managing people at workplace through motivation, leadership, culture, performance management, career planning & development and stress management. Upon completion of this course, the students should be able to:

- Explain and apply principles of organizational behavior and management.
- Understanding management and organizational behavior with reference to key organizations in the IT sector- Apple, Intel, Cisco, Infosys, Google, IBM.
- Identify individual and organizational practices for managing workplace stress.
- Understand group dynamics, and specifically the way individuals within a group work together to attain certain goals.
- Understand organizational culture and managing change in organizations.

PRE-REQUISITE:
- Concept of Formal and Informal Organization Management

UNIT - I
Introduction to OB and Management Principles
Conceptual Framework; Challenges and Opportunities for OB ;Managerial Implications ;Evolution of Management Principles ; Scientific Management Theories ; Taylor and Scientific Management, Fayol’s Administrative Management, Bureaucracy, Hawthorne Experiments and Human Relations, Social System Approach ;Management Vs. Administration, Management Skills, Levels of Management, Characteristics of Quality Managers. Evolution of Management: Early contributions.  
[No. of Hrs : 12]
Tutorial : [No. of Hrs: 04]
2 Article Review Presentations

UNIT - II
Planning: Types, Process & barriers, Management by Objectives; Organizational context of decisions, Types & process of decision making ; Controlling; Organizing: Concept, Organisation Theories, Forms of Organisational Structure, Combining Jobs: Departmentation, Span of Control, Delegation of Authority, Authority & Responsibility, Staffing: Concept, System Approach, Manpower Planning, Job Design, Recruitment & Selection, Training & Development

[No. of Hrs.; 10]
Tutorial : [No. of Hrs: 41]
Case 1: HBS case John Chambers – CISCO’s Driving Force.
Case 2 : Larry Ellison - The Source of Oracle Wisdom, HBS case.
UNIT - III
Organizational structure & Design, Organizational Designs; Emerging Design Options
Different Organizational Structures; Organizational Culture (creation and sustenance of cultures)
Importance of Culture; Managing Culture; High performance culture, Learning organizations,
Orgaizational climate, Total Quality Management, Techniques of TQM, Re-engineering,
Empowerment, Benchmarking, Downsizing, Controlling: Concept, Types of Control, Methods:
Pre-control: Concurrent Control: Post-control, An Integrated Control System, Model for
Managing Change, Forces for Change, resistance to change, Management of resistance.

Hrs.; 10]
Tutorial : [No. of Hrs: 04/week]
Case 1 : Case of Infosys (Learning Organisation) ICMR-LDEN003- ECCH-402-017-1
Case 2 : Case of Google culture.
Case 3: Article : Louis Gerstner The Man Who Turned IBM Around’ ICMR

UNIT - IV
Individual Determinants of organizational, Behaviours; Motivation, Motivation and Performance,
Theories Of Motivation, Approaches for Improving Motivation, Pay and Job Performance,
Quality of Work Life, Morale Building, Performance Appraisal, Job Anxiety & Stress,
Analysing, Interpersonal relations, Group Dynamics, Management of Organizational Conflicts,
Management of Change, Leadership Styles & Influence Ethics and leadership.

Hrs.; 10]
Tutorial : No. of Hrs: 04/week]
Case 1 : Apple Inc. HBS (February 29, 2008) Yoggie David B. Sturd Michael ; N9-708-480
Case2: Article Review : Leadership the Bill Gates Way –HBS case. [No. of Hrs: 01]

TEXT BOOKS:
Organizational Behavior (Text & Cases)”, Sun India Publications, 2009.

REFERENCES:
2004.
2002.
OBJECTIVE: The objective of this course is to introduce the fundamental techniques on which high-performance computing is based, to develop the foundations for analysing the benefits of design options in computer architecture, and to give some experience of the application of these techniques. It should be noted that the use of parallelism is secondary to the objective of achieving high performance.

PRE-REQUISITE: 
- Computer Organization

UNIT – I
Parallel computer models: The state of computing, Multiprocessors and multicomputers, Multivector and SIMD computers, Architectural development tracks
Program and network properties: Conditions of parallelism, Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Program flow mechanisms, Control flow versus data flow, Data flow architecture, Demand driven mechanisms, Comparisons of flow mechanisms. [No. of Hrs.: 10]

UNIT - II
System Interconnect Architectures: Network properties and routing, Static interconnection networks, Dynamic interconnection Networks, Multiprocessor system interconnects, Hierarchical bus systems, Crossbar switch and multiport memory, Multistage and combining network.
Memory Technology: Hierarchical memory technology, Inclusion, Coherence and Locality, Memory capacity planning, Virtual Memory Technology. [No. of Hrs.: 11]

UNIT - III
Backplane Bus System: Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt, Cache addressing models, Direct mapping and associative caches.
Pipelining: Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, Dynamic instruction scheduling, Branch handling techniques, Arithmetic Pipeline Design, Computer arithmetic principles, Static arithmetic pipeline, Multifunctional arithmetic pipelines. [No. of Hrs.: 11]

UNIT - IV
Vector Processing Principles: Vector instruction types, Vector-access memory schemes.
TEXT BOOKS:

REFERENCES:
3. Hwang and Briggs, “Computer Architecture and Parallel Processing”, MGH.
OBJECTIVE: This course covers the issues and techniques related to the Quality Management of software. The course will be helpful for the students and to get acquaint with the industry perspective towards software Quality. The content covers:

- Basic Concepts of Software Quality.
- Software Quality Assurance.
- Formal Technical Reviews.
- How it can be implemented.
- Describe how to conduct formal technical reviews and why they are the most important SQA activity.

PRE-REQUISITE:
- Concepts of Software Engineering

UNIT - 1


UNIT - II
Tailoring the Software Quality Assurance Program: Reviews, Walkthrough, Inspection, and Configuration Audits.
Evaluation: Software Requirements, Preliminary design, Detailed design, Coding and Unit Test, Integration and Testing, System Testing, types of Evaluations.
Testing: Types of testing, Test Planning and conduct, Who does the testing? [No. of Hrs.: 12]

UNIT - III

UNIT - IV
Defect Analysis: Analyzing concepts, Locating data, Defect Repair and closure, Selecting metrics, Collecting measurements, Quality tools, Implementing defect analysis, Program Unit Complexity.
Corrective Action as to Cause: Identifying the Requirement for Corrective Action, Determining the Action to be Taken, Implementing the Correcting the corrective Action, Periodic Review of Actions Taken.

[No. of Hrs.: 10]

TEXT BOOKS:

REFERENCE:
INSTRUCTIONS TO PAPER SETTERS:
1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks including subparts, if any.

OBJECTIVE
This course is an introduction to DSP concepts and implementation. It starts by explaining the need for digital signal processing and DSP systems. A complete model of a DSP system is examined from the input transducer, through all the stages including: signal conditioning, anti-aliasing filter, analog-to-digital and digital-to-analog conversion, output smoothing filter, and output transducer. Correct acquisition of the signal is absolutely necessary for proper use of digital signal processing.

PREREQUISITE
- Digital Electronics
- Operating System

UNIT – I

Signals and signal Processing: characterization & classification of signals, typical Signal Processing operations, example of typical Signals, typical Signals Processing applications.

Time Domain Representation of Signals & Systems: Discrete Time Signals, Operations on Sequences, the sampling process, Discrete-Time systems, Time-Domain characterization of LTI Discrete-Time systems.  

UNIT – II
Transform-Domain Representation of Signals: the Discrete-Time Fourier Transform, Discrete Fourier Transform, DFT properties, computation of the DFT of real sequences, Linear Convolution using the DFT. Z-transforms, Inverse z-transform, properties of ztransform, transform domain representations of random signals, FFT.

Transform-Domain Representation of LTI Systems: the frequency response, the transfer function, types of transfer function, minimum-phase and maximum-Phase transfer functions.

UNIT – III
Digital Processing of continuous-time signals: sampling of continuous signals, analog filter design, anti-aliasing, filter design, sample-and-hold circuits, A/D & D/A converter, reconstruction filter design.

Digital Filter Structure: Block Diagram representation, Signal Flow Graph Representation, Equivalent Structures, FIR Digital Filter Structures, IIR Filter Structures. transfer, modes of data transfer, priority interrupt, direct memory access, input-output processor.

UNIT – IV
tonner sens, FIR filter design based on Frequency Sampling approach. Applications of DSP.

Hrs: 10]

TEXT BOOKS:

REFERENCES:
Practical will be based on following:

1. Linux Programming Lab  MCA 351
2. Software Testing Lab    MCA 353
3. Enterprising Lab        MCA 355
4. Lab based on Elective-I  MCA 357
Code No. : MCA 361  
Paper: General Proficiency – V*

It is suggested to have a fundamental course Intellectual Property Rights (Software Systems Oriented) in this semester.

This paper is under Non University Examination system its detail content will be decided by the respective Institute, under approval of the coordination committee based on the requirement of individual institution.

*Non University Examination Scheme (NUES)

There will not be any external examination of the university. The performance of the candidates should continuously be evaluated by an internal committee. The committee may conduct viva-voce at the end for the award of the marks.