

**MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE,  
GWALIOR**

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

*Syllabi of  
Open Category Courses  
B.Tech VI Semester  
(Computer Science and Engineering)  
Batch admitted in 2019-20*

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Department of Computer Science and Engineering

## DATA STRUCTURES 900106 (OC-1)

### COURSE OBJECTIVES

- To be familiar with the use of data structures as the foundational base for computer solutions to problems.
- To understand various techniques of searching and sorting.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

#### Unit-I

**Introduction to Data Structures:** Algorithms & their Characteristics, Asymptotic Notations. Arrays and its Representations, Index to Address Translation. **Linked List:** Introduction, Implementation of Linked List, Operations, Circular Linked List, Doubly Linked List, Polynomial Manipulation using Linked List.

#### Unit-II

**Stacks:** Concepts and Implementation of Stacks, Operations on Stack, Conversion of Infix to Postfix Notation, Evaluation of Postfix Expression, Recursion.

**Queues:** Concepts and Implementation, Operations on Queues, Dequeue, Priority Queues, Circular Queues and Application.

#### Unit-III

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**Trees:** Types, Terminology, Binary Tree -Representations, Traversal, Conversion of General Tree to Binary Tree, Binary Search Tree, Threaded Binary Tree and Height Balanced Tree.

## Unit-IV

**Graphs:** Background, Graph Theory Terminologies, Representation of Graphs- Sequential & Linked Representation, Path Matrix, Graph Traversals- BFS, DFS, Spanning Trees, Applications of Graph.

## Unit-V

**Searching & Sorting:** Linear Search, Binary Search, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Radix Sort and Heap Sort, Comparison between Sorting Techniques, Hashing and Collision Resolution Techniques.

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

## RECOMMENDED BOOKS

- Data Structures, Algorithms and Applications in C++, Sartaj Sahni, 2<sup>nd</sup> Edition.
- An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Mcgraw hill.
- Data Structures & Algorithms, Aho, Hopcroft & Ullman, original edition, Pearson Publication.

## COURSE OUTCOMES

After completion of this course, the students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	outline the basics of algorithms and their performance criteria.	Skill development
2	explain the working of linear/non-linear data structures.	Entrepreneurship
3	identify the appropriate data structure to solve specific problems.	Employability
4	analyze the performance of various data structures & their applications.	Skill development
5	evaluate the time/space complexities of various data structures & their applications.	Entrepreneurship
6	design the optimal algorithmic solutions for various problems.	Entrepreneurship

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE,

Department of Computer Science and Engineering

## PYTHON PROGRAMMING 900107 (OC-1)

### COURSE OBJECTIVES

- To understand the structure and components of a python program.
- To learn the basic construct of python programming for implementing interdisciplinary research-based problems.
- To plot data using appropriate python visualization libraries for analysis.

#### Unit I

**Introduction to Python:** Setting Up Programming Environment, Running Python Programs from a Terminal, Variables and Simple Data Types: Variables, Strings, Numbers and Maths, Comments, Conditional Statements, Introducing Loops, Working of Input Function.

#### Unit II

**Tuples and Lists:** Tuples, Lists, List Operations, Using If Statements with Lists, Organizing a List, Working with Lists: Looping through Entire List, Making Numeric Lists, Working with Part of List. **Dictionaries and Sets:** Simple Dictionary, Looping Through a Dictionary, Nesting, Example with a Dictionary, Fibonacci and Dictionaries, Global Variables, Defining a Set, Set Operations.

#### Unit III

**Functions:** Defining a Function, Passing Arguments, Return Values, Passing a List, Passing an Arbitrary Number of Arguments, Storing Functions in Module, In- Built Functions, Lambda Functions. **Classes and Inheritance:** Object Oriented Programming, Creating and using a Class, Working with Class Instances, Methods, Inheritance, Importing Classes, Python Standard Library.

#### Unit IV

**Files and Exceptions:** Reading from a File, Writing to a File, File Operations, Assertions, Exceptions, Exception example. **Debugging:** Programming Challenges, Classes of Tests, Bugs, and Debugging, Debugging examples.

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## Unit V

**Data Visualization:** Installing Matplotlib, Plotting a Simple Line Graph, Random Walks, Making Histogram. **Graphical User Interfaces:** Event-Driven Programming Paradigm; Tkinter Module, Creating Simple GUI; Buttons, Labels, Entry Fields, Dialogs; Widget Attributes - Sizes, Fonts, Colors, Layouts, Nested Frames.

## RECOMMENDED BOOKS

- Python Crash Course: A Hands-On, Project-Based Introduction to Programming, By Eric Matthes.
- Learn Python the Hard Way: 3rd Edition.
- T.R. Padmanabhan, Programming with Python, Springer, 1st Ed., 2016.
- Kenneth Lambert, Fundamentals of Python: First Programs, Cengage Learning, 1st Ed., 2012.

## COURSE OUTCOMES

After completion of this course, the students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	understand basic python programming constructs	Skill development
2	analyze various data structures available in python	Employability
3	implement the Object-oriented programming paradigm in Python	Employability
4	apply the different File handling operations	Entrepreneurship
5	design GUI Applications in Python	Entrepreneurship
6	construct graphical representation of data using python packages .	Entrepreneurship

**MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE,**

*Syllabi of  
Departmental Courses (DC) Courses  
B.Tech IV Semester  
(Computer Science and Engineering)  
Under Flexible Curriculum*

Department of Computer Science and Engineering

**COMPUTER NETWORKS  
150411 (DC)**

**COURSE OBJECTIVES**

- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.

**Unit-I**

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**Introduction:** Computer Network, Types- LAN, MAN & WAN, Data transmission modes- Serial & Parallel, Simplex, Half duplex & full duplex, Synchronous & Asynchronous transmission, Transmission medium- Guided & Unguided, Cables- Twisted pair, Coaxial cable & Optical fiber, Networking devices-Repeaters, Hub, Switch, Bridge, Router, Gateway, Modem, Proxy Server, Wireless router, & Wireless Access Point (WAPs). Performance Criteria- Bandwidth, Throughput, Latency (Delay), Propagation Time, Transmission time & Queuing Time, Network Standardization- OSI Reference Model & TCP/IP Reference Mode.

## Unit-II

**Physical Layer:** Network topologies- Bus, Ring, Star Topology & Mesh, Switching- Circuit switching, Message switching & Packet switching, Multiplexing; FDM – Frequency division multiplexing, WDM – Wavelength division multiplexing & TDM – Time division multiplexing, Wireless transmission- Electromagnetic spectrum, Radio transmission & Microwave transmission.

## Unit-III

**Data Link Layer:** Introduction, Design issues, Services, Framing, Error control, Flow control, ARQ Strategies, Error Detection and correction, Parity bits, Cyclic Redundant Code (CRC), Hamming codes, MAC Sub Layer- The channel allocation problem, Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA, IEEE 802.3 frame format.

## Unit-IV

**Network Layer & Transport Layer:** Introduction, Design issues, Services, Routing- Distance vector routing, Hierarchical routing, Link state routing, Shortest path algorithm- Dijkstra's Algorithm & Floyd-Warshall's Algorithm, Flooding, Congestion Control- Open Loop & Closed Loop Congestion Control, Leaky Bucket & Token bucket Algorithm. Connection Oriented & Connectionless Service, Port addressing basics.

## Unit-V

**Presentation, Session & Application Layer:** Introduction, Design issues, Presentation layer- Translation, Encryption & Compression. Session Layer – Dialog Control, Synchronization. Application Layer- Remote login, File transfer & Electronic mail.

## RECOMMENDED BOOKS

- Behrouz A. Forouzan “Data Communication and Networking”, McGraw – Hill Publications.
- Andrew Tanenbaum – Computer Networks, PHI
- Peterson and Davie, “Computer Networks, A systems Approach”, 5<sup>th</sup> ed., Elsevier, 2011.
- Ying-Dar Liu, Ren-Hwang, Fred Baker, “Computer Networks: An open Source Approach”, McGraw – Hill, 2001.

## COURSE OUTCOMES

After completion of the course students would be able to:



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S. No	COURSE OUTCOMES (COs)	Mapping
1	Outline the Data Communications System and its components.	Skill development
2	Identify the different types of network topologies and protocols.	Employability
3	Enumerate the layers of the OSI model and function(s) of each layer.	Employability
4	Identify the different types of network devices and their functions within a network	Entrepreneurship
5	Analyze the problems associated with various networking protocols and measure the Performance	Employability
6	Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation	Skill development

Department of Computer Science and Engineering

## **DATABASE MANAGEMENT SYSTEM 150412 (DC)**

### **COURSE OBJECTIVES**

- To understand the fundamental concepts of a database management system.
- To analyse database requirements and determine the entities involved in the system and their relationship to one another.
- To develop the logical design of the database using data modelling concepts & normalization.
- To manipulate a database using SQL commands.

### **Unit-I**

**Introduction:** DBMS Concepts & Architecture, File processing system, limitation of file processing system, Advantages of Database System, Schemas, Instances, Data Independence, Data dictionary, Functions of DBA, Database languages, Data Models:

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Hierarchical Data Model, Network Data Model & Relational Data Model, E-R Model, Comparison between Models, Introduction of File organization Techniques.

## Unit-II

**Relational Data Models:** Entities & Attributes, Entity types, Key Attributes, Relationships, Domains, Tuples, types of Attributes, Relations, Characteristics of Relations, Keys, Attributes of Relation, Relational Database, Integrity Constraints.

Relational Algebra: Concept and Relational Algebra operations like Select, Project, Join, Division, Union etc.

## Unit-III

**SQL:** Introduction of SQL, features of SQL, Data Definition & Data Manipulation commands in SQL, SQL operators, Update Statements & Views in SQL, Query & Sub query, Data Retrieval Queries & Data Manipulation Statements examples etc. Overview of Tuple Oriented Calculus & Domain Oriented Relational Calculus.

## Unit-IV

**Normalization:** Introduction to Normalization, concepts of anomalies and its types, closure set of dependencies and of attributes, Various Normal Forms: 1NF, 2NF, 3NF, BCNF, Functional Dependency, Decomposition, Dependency Preservation, Loss Less & Lossy Join, Definition of Dangling Tuple, and Multi-values Dependencies.

## Unit-V

**Transaction Processing & Concurrency Control:** Transaction Processing Concepts, ACID properties, State Diagram, Types of Transaction, Basic idea of serializability, Concurrency Control, Concurrent operation of Databases, Recovery, Types of Recovery, Basic overview of Distributed Databases System and Relational Database Management System, Concepts of Object-Oriented Database System and its tools.

## RECOMMENDED BOOKS

- Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill, 6th Edition.
- Raghu Ramakrishnan, Johannes Gehrke, "Database Management System", McGraw Hill., 3rd Edition.
- Elmasri & Navathe, "Fundamentals of Database System", Addison-Wesley Publishing, 5th Edition.
- Date C.J, "An Introduction to Database", Addison-Wesley Pub Co, 8th Edition.
- B.C. Desai, "An introduction to Database systems"

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## COURSE OUTCOMES

After completion of the course students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	Define the terminology, features, classifications, and characteristics embodied in database systems.	Skill development
2	Identify different issues involved in the design and implementation of database system.	Skill development
3	Analyse database schema for a given problem domain.	Skill development
4	Justify principles for logical design of databases, including the E-R modeling and Normalization approach.	Entrepreneurship
5	Apply transaction processing concepts and recovery methods over real time data.	Employability
6	Formulate, using relational algebra and SQL, solutions to a broad range of query Problems.	Skill development

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE,

Department of Computer Science and Engineering

## SOFTWARE ENGINEERING 150413 (DC)

### COURSE OBJECTIVES

- To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
- To understand project management and risk management associated with various types of projects.
- To know basics of testing and understanding concept of software quality assurance and software configuration management process.

### Unit-I

**Introduction to Software Engineering:** Definition, software engineering-layered Technology, Software Characteristics and Components, Software model: Software Development of Life Cycle Model (SDLC), The Waterfall Model, Iterative Waterfall Model, Prototyping Model, Spiral Model, RAD Model. Selection criteria of model: Characteristics of Requirements, Status of Development Team, Users participation, Type of Project and Associated Risk.

### Unit - II

**Requirement Engineering:** Definition, Requirement Engineering Activity , Types of Requirement- Functional and Non-functional Requirements, User and System Requirements, Requirement Elicitation Methods, Requirement Analysis Methods, Requirement Documentation (SRS), Requirement Validation, Requirement Management.

### Unit – III

**Design Concept, Principle and Methods:** Design Fundamentals, Design Principles, Effective Modular Design, Design Representations, Architectural design, Procedural design, data Directed design, Real Time Design, Object Oriented Design, Coupling and Cohesion.

### Unit - IV

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**Software Metrics, Project Management and Estimation:** Metrics in Process and Project domains, Software Measurement, Software Quality Metrics, Project Management- Basics-People, Product, Process, Project, Estimation- Software Project Estimation, Decomposition Techniques- Function Point Estimation, Line of Code (LOC) based estimation, Empirical Estimation, COCOMO Model, Project Scheduling Techniques.

## Unit – V

**Software Testing:** Definitions, Software Testing Life Cycle (STLC), , Test Case Design, Strategic Approach to Software Testing- Verification & Validation , Strategic issues, Criteria for completion of Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Black Box Testing Techniques, White Box Testing Techniques, Acceptance Testing.

## RECOMMENDED BOOKS

- Software Engineering, Sommerville, Pearson.
- Software Engineering: A Practitioner’s Approach, Roger S. Pressman, McGraw Hill.
- Software Engineering, K.K. Agrawal & Yogesh Singh, New Age Publication.
- Software Engineering, Rajib Mall, PHI.

## COURSE OUTCOMES

After completion of the course students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	Explain the various fundamental concepts of software engineering.	Skill development
2	Develop the concepts related to software design & analysis.	Skill development
3	Compare the techniques for software project management & estimation.	Entrepreneurship
4	Choose the appropriate model for real life software project.	Entrepreneurship
5	Design the software using modern tools and technologies.	Employability
6	Test the software through different approaches.	Skill development

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE,

150414 (DC)

## COURSE OBJECTIVE

- To understand computability, decidability, and complexity through problem solving.
- To analyse and design abstract model of computation & formal languages
- To understand and conduct mathematical proofs for computation and algorithms.

### Unit-I

**Introduction to Theory of Computation:** Automata, Computability and Complexity, Alphabet, Symbol, String, and Formal Languages, Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and Mealy machines, Composite Machine, Conversion from Mealy to Moore and vice versa.

### Unit-II

**Types of Finite Automata:** Non Deterministic Finite Automata (NFA), Deterministic finite automata machines, conversion of NFA to DFA, minimization of automata machines, regular expression, Arden's theorem. Pumping lemma, applications, Closure properties of regular languages, 2 way DFA.

### Unit-III

**Grammars:** Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, Rightmost and Leftmost derivations of Strings, ambiguity in grammar, simplification of context free grammar, killing null and unit productions, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar, Chomsky Normal Form (CNF) and Greibach Normal Form (GNF).

### Unit-IV

**Push down Automata:** Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack, Example of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA.

### Unit-V

**Turing Machine:** Techniques for construction. Universal Turing machine Multitape, multihead and multidimensional Turing machine, N-P complete problems. Decidability and Recursively Enumerable Languages, decidability, decidable languages, undecidable languages, Halting problem of Turing machine & the post correspondence problem (PCP).

## RECOMMENDED BOOKS

- Introduction to Automata Theory Language & Computation, Hopcroft & Ullman, Narosa Publication.
- Element of the Theory Computation, Lewis & Christors, Pearson.
- Theory of Computation, Chandrasekhar & Mishra, PHI.

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- Theory of Computation, Wood, Harper & Row.
- Introduction to Computing Theory, Daniel I-A Cohen, Wiley.

## COURSE OUTCOMES

After completion of this course, the students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	Explain the basic concepts of switching and finite automata theory & languages.	Entrepreneurship
2	Relate practical problems to languages, automata, computability and complexity.	Skill development
3	Construct abstract models of computing and check their power to recognize the languages.	Entrepreneurship
4	Analyse the grammar, its types, simplification and normal form.	Entrepreneurship
5	Interpret rigorously formal mathematical methods to prove properties of languages, grammars and automata.	Employability
6	Develop an overview of how automata theory, languages and computation are applicable in engineering application.	Entrepreneurship

Department of Computer Science and Engineering

**PROGRAMMING LAB.**  
**150415(DLC)**  
**Python Programming**

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE,

## COURSE OBJECTIVES

- To understand components of Python Program
- To learn the basic construct of python programming for solving real world research-based problems.
- To visualize and analyze data using python libraries

### Unit 1:

Setting up programming environment, running python programs from a terminal, variables and simple data types: variables, strings, numbers and maths, comments, conditional statements.

### Unit 2:

Introducing loops, working of input function, various operations on Tuples, lists, Set and Dictionary, Loops, Conditional Statement,

### Unit 3:

Built in function, defining a function, passing arguments, return value, lambda function, exception handling

### Unit 4:

Object oriented programming, Creating and using class and object, methods, inheritance, debugging.

### Unit 5:

Working with packages, pandas, NumPy, Matplotlib and scikit-learn

## RECOMMENDED BOOKS

- Python Crash Course: A Hands-On, Project-Based Introduction to Programming, By Eric Matthes
- Learn Python the Hard Way: 3rd Edition
- T.R. Padmanabhan, Programming with Python, Springer, 1st Ed., 2016.
- Kenneth Lambert, Fundamentals of Python: First Programs, Cengage Learning, 1st Ed., 2012.

## COURSE OUTCOMES



# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE,

After successful completion of course, the student will be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	Tell the use of various built-in data structures used in python.	Entrepreneurship
2	Outline the working of file handling operations, normal functions and lambda functions in python.	Skill development
3	Apply the concepts of object oriented programming in python.	Employability
4	Analyze the data and visualize it using python's matplotlib.	Entrepreneurship
5	Rule out various important characteristics of data using scikit-learn package.	Employability
6	Create efficient algorithms in python to solve real world problems.	Skill development

*Syllabi of  
Departmental Courses (DC) Courses  
B.Tech II Semester  
For batch admitted 2021-22  
(Computer Science and Design)  
Under Flexible Curriculum*

**DIGITAL ELECTRONICS**

**290201 (DC-1)**

**COURSE OBJECTIVES**

- To perform the analysis and design of various digital electronic circuits.
  - To learn various number systems, boolean algebra and logic gates.
  - To understand the concept of counters, latches and flip-flops.
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**Unit-I**

Introduction to Digital Electronics, Needs and Significance, Different Number System: Binary Numbers, Octal and Hexadecimal Numbers, Conversions, Complement's, Signed Binary Numbers, Binary Arithmetic's, Binary Codes: BCD, ASCII Codes.

**Unit-II**

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Boolean Relations, Digital Logic Gates, De Morgan's Theorem, Karnaugh Maps and simplifications, Prime Implicants and Essential Prime Implicants definition.

**Unit-III**

Combinational Circuits, Half Adder, Half Subtractor, Full Adder and Full Subtractor, Binary Adder-Subtractor, Binary Multiplier, Comparator, Decoders, Encoders, Multiplexers, Demultiplexer.

**Unit-IV**

Sequential Circuits, Latches, Flip-Flops: RS Latches, Level Clocking, D Latches, Edge-triggered D Flip-flop, Edge-triggered JK Flip-flop, JK Master-slave Flip-flop; Registers, Shift Registers, Counters, Ripple Counters, Synchronous Counters.

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE,

## Unit-V

Introduction to Memory, Memory Decoding, Error Detection and Correction, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices, RTL and DTL Circuits, TTL, ECL, MOS, CMOS, Application Specific Integrated Circuits.

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## RECOMMENDED BOOKS

- Digital Design, Morris Mano M. and Michael D. Ciletti, IV Edition, Pearson Education.
  - Digital Electronics: Principles, Devices and Applications, Anil K. Maini, Wiley.
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## COURSE OUTCOMES

After completion of the course students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	Explain the computer architecture for defining basic component and functional	Entrepreneurship
2	Recall different number system and solve the basic arithmetic operations.	Skill development
3	Develop the understanding of combinational circuits.	Skill development
4	Analyze the basic concept of sequential circuits.	Entrepreneurship
5	Compare various memories.	Employability
6	Solve the boolean functions using logic gates.	Skill development

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE,

## DATA STRUCTURES 290202 (DC-2)

### COURSE OBJECTIVES

- To be familiar with the use of data structures as the foundational base for computer solutions to problems.
  - To understand various techniques of searching and sorting.
  - To understand basic concepts about stacks, queues, lists, trees and graphs.
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#### Unit-I

**Introduction to Data Structures:** Algorithms & their characteristics, asymptotic notations. arrays and its representations, index to address translation. **Link list:** Introduction, implementation of linked list, operations, circular link list, doubly linked list, polynomial manipulation using linked list.

#### Unit-II

**Stacks:** Concepts and implementation of stacks, operations on stack, conversion of infix to postfix notation, evaluation of postfix expression, recursion.

**Queues:** Concepts and implementation, operations on queues, dequeue, priority queues, circular queues and application.

#### Unit-III

**Trees:** Types, terminology, binary tree -representations, traversal, conversion of general tree to binary tree, binary search tree, threaded binary tree and height balanced tree.

#### Unit-IV

**Searching & Sorting:** Linear search, binary search, bubble sort, selection sort, insertion sort, quick sort, merge sort, radix sort and heap sort, comparison between sorting techniques, hashing and collision resolution techniques.

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## Unit-V

**Graphs:** Background, graph theory terminologies, representation of graphs- sequential & linked representation, path matrix, graph traversals- BFS, DFS, spanning trees, applications of graph.

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### RECOMMENDED BOOKS

- Data Structures, Algorithms and Applications in C++, Sartaj Sahni, 2<sup>nd</sup> Edition.
  - An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Mcgraw hill.
  - Data Structures & Algorithms, Aho, Hopcroft & Ullman, original edition, Pearson Publication.
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### COURSE OUTCOMES

After completion of this course, the students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	Outline the basics of Algorithms and their performance criteria's.	Skill development
2	Explain the working of linear/Non Linear data structures.	Skill development
3	Identify the appropriate data structure to solve specific problems.	Skill development
4	Analyze the performance of various Data Structures & their applications.	Entrepreneurship
5	Compare various memories.	Employability
6	Design the optimal algorithmic solutions for various problems.	Entrepreneurship

**OBJECT ORIENTED PROGRAMMING AND METHODOLOGY  
290203 (DC-3)**

**COURSE OBJECTIVES**

- To study about the concept of object oriented programming.
  - To create C++ programs that leverage the object oriented features of the C++ Language.
  - To apply object oriented or non-object oriented techniques to solve bigger computing problems.
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**Unit-I**

**Introduction to C++ and Object Oriented**

**Concepts:** Basics of C++, Tokens, I/O Statements, Structure of Program, Operators and Expressions, Flow of Control, Arrays, Structures, Functions and its type, Function Prototyping, Pointers, Pointer Variables, Pointers and Arrays, Array of Pointers, Pointers and Structures, Dynamic Memory Allocation.

**Programming Techniques:** Unstructured & Structured Programming, Object Oriented Paradigm, Features of OOPS, Comparison with Procedural Oriented Programming & Object Oriented Programming, Abstract Data Types, Reference Variable, Scope Resolution Operator.

**Unit-II**

**Classes & Objects:** Specification of Class, Visibility Modes: Private, Public, Protected, Defining Member Functions, Creating of Objects, Characteristics of Object, Static Data Member, Static Member Function, Array of Objects, Object as Arguments, Inline Function, Default Arguments, Friend Function, Recursion.  
**Constructors and Destructors:** Introduction,

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Types of Constructors- Default Constructor, with Default Arguments, Rules of Constructor User Defined Constructor, Parameterized Definition and Usage, Destructors. Constructor, Copy Constructor, Constructor

### **Unit-III**

**Polymorphism:** Introduction, Type of Polymorphism: Compile Time Polymorphism & Run Time Polymorphism, Function Overloading, Operator Overloading: Binary Operators, Arithmetic Assignment Operators, Unary Operators, Rules for Operator Overloading, Pitfalls of Operator Overloading, Data Conversion, Type Casting.

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE,

## Unit-IV

**Inheritance:** Introduction to Code Reuse, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath. Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Nesting of Classes, Overriding Member Function. Containership: Classes with in Classes, Function Overriding.

## Unit-V

**Pointer & File Concept:** Pointers Overview, Pointers to Objects, This Pointer, Pointers to Derived Classes, Virtual Functions & Pure Virtual Function, Association, Type of Association, Aggregation, File Concepts, Study of Various Files and Streams, Opening and Closing of Files- Functions Get(), Getline(), Put(), Opening The Files Using Function Open(), File Manipulator Function.

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## RECOMMENDED BOOKS

- C++ How to Program, H M Deitel and P J Deitel, Prentice Hall.
- Programming with C++, D Ravichandran, T.M.H.
- Computing Concepts with C++ Essentials, Horstmann, John Wiley.
- The Complete Reference in C++, Herbert Schildt, TMH.
- Object-Oriented Programming in C++, E Balagurusam.
- Fundamentals of Programming C++, Richard L. Halterman.



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## **COURSE OUTCOMES**

After completion of this course, the students would be able to:

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<b>S. No</b>	<b>COURSE OUTCOMES (COs)</b>	<b>Mapping</b>
1	Tell the concepts of classes & objects and their significance in real world.	Skill development
2	Explain the benefits of object oriented design.	Skill development
3	Build C++ classes using appropriate encapsulation and design principles.	Employability
4	Analyze the utilization of inheritance and polymorphism in the solution of problems.	Entrepreneurship
5	Choose appropriate object orient programming concepts for solving real world problems.	Skill development
6	Develop solutions to problems demonstrating usage of control structures, modularity, I/O and other standard language constructs.	Employability

*Syllabi of  
Departmental Courses (DC) Courses  
B.Tech II Semester  
For batch admitted 2020-21  
(Computer Science & Engineering)  
Under Flexible Curriculum*

**DATA STRUCTURES  
150211 (DC-1)**

**COURSE OBJECTIVES**

- To be familiar with the use of data structures as the foundational base for computer solutions to problems.
  - To understand various techniques of searching and sorting.
  - To understand basic concepts about stacks, queues, lists, trees and graphs.
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**Unit-I**

**Introduction to Data Structures:** Algorithms & their characteristics, asymptotic notations. arrays and its representations, index to address translation. **Link list:** Introduction, implementation of linked list, operations, circular link list, doubly linked list, polynomial manipulation using linked list.

**Unit-II**

**Stacks:** Concepts and implementation of stacks, operations on stack, conversion of infix to postfix notation, evaluation of postfix expression, recursion.

**Queues:** Concepts and implementation, operations on queues, dequeue, priority queues, circular queues and application.

**Unit-III**

**Trees:** Types, terminology, binary tree -representations, traversal, conversion of general tree to binary tree, binary search tree, threaded binary tree and height balanced tree.

**Unit-IV**

**Searching & Sorting:** Linear search, binary search, bubble sort, selection sort, insertion sort, quick sort, merge sort, radix sort and heap sort, comparison between sorting techniques, hashing and collision resolution techniques.

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## Unit-V

**Graphs:** Background, graph theory terminologies, representation of graphs- sequential & linked representation, path matrix, graph traversals- BFS, DFS, spanning trees, applications of graph.

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### RECOMMENDED BOOKS

- Data Structures, Algorithms and Applications in C++, Sartaj Sahni, 2<sup>nd</sup> Edition.
  - An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Mcgraw hill.
  - Data Structures & Algorithms, Aho, Hopcroft & Ullman, original edition, Pearson Publication.
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### COURSE OUTCOMES

After completion of this course, the students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	outline the basics of Algorithms and their performance criteria's.	Skill development
2	explain the working of linear/Non Linear data structures.	Skill development
3	identify the appropriate data structure to solve specific problems.	Employability
4	analyze the performance of various Data Structures & their applications.	Employability
5	evaluate the time/space complexities of various data structures & their applications.	Skill development
6	design the optimal algorithmic solutions for various problems.	Entrepreneurship

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**OBJECT ORIENTED PROGRAMMING AND METHODOLOGY  
150212 (DC-2)**

**COURSE OBJECTIVES**

- To study about the concept of object oriented programming.
  - To create C++ programs that leverage the object oriented features of the C++ Language.
  - To apply object oriented or non-object oriented techniques to solve bigger computing problems.
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**Unit-I**

**Introduction to C++ and Object Oriented**

**Concepts:** Basics of C++, Tokens, I/O Statements, Structure of Program, Operators and Expressions, Flow of Control, Arrays, Structures, Functions and its type, Function Prototyping, Pointers, Pointer Variables, Pointers and Arrays, Array of Pointers, Pointers and Structures, Dynamic Memory Allocation.

**Programming Techniques:** Unstructured & Structured Programming, Object Oriented Paradigm, Features of Oops, Comparison with Procedural Oriented Programming & Object Oriented Programming, Abstract Data Types, Reference Variable, Scope Resolution Operator.

**Unit-II**

**Classes & Objects:** Specification of Class, Visibility Modes: Private, Public, Protected, Defining Member Functions, Creating of Objects, Characteristics of Object, Static Data Member, Static Member Function, Array of Objects, Object as Arguments, Inline Function, Default Arguments, Friend Function, Recursion.

**Constructors and Destructors:** Introduction, Types of Constructors- Default Constructor,

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User Defined Constructor, Parameterized with Default Arguments, Rules of Constructor  
Constructor, Copy Constructor, Constructor Definition and Usage, Destructors.

## **Unit-III**

**Polymorphism:** Introduction, Type of Polymorphism: Compile Time Polymorphism &  
Run Time Polymorphism, Function Overloading, Operator Overloading: Binary  
Operators, Arithmetic Assignment Operators, Unary Operators, Rules for Operator  
Overloading, Pitfalls of Operator Overloading, Data Conversion, Type Casting.

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## Unit-IV

**Inheritance:** Introduction to Code Reuse, Visibility Modes, Types of Inheritance: Single Level, Multilevel, Multiple, Hybrid, Multipath. Virtual Base Classes, Abstract Classes, Constructors in Derived Classes, Nesting of Classes, Overriding Member Function. Containership: Classes with in Classes, Function Overriding.

## Unit-V

**Pointer & File Concept:** Pointers Overview, Pointers to Objects, This Pointer, Pointers to Derived Classes, Virtual Functions & Pure Virtual Function, Association, Type of Association, Aggregation, File Concepts, Study of Various Files and Streams, Opening and Closing of Files- Functions Get(), Getline(), Put(), Opening The Files Using Function Open(), File Manipulator Function.

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## RECOMMENDED BOOKS

- C++ How to Program, H M Deitel and P J Deitel, Prentice Hall.
- Programming with C++, D Ravichandran, T.M.H.
- Computing Concepts with C++ Essentials, Horstmann, John Wiley.
- The Complete Reference in C++, Herbert Schildt, TMH.
- Object-Oriented Programming in C++, E Balagurusam.
- Fundamentals of Programming C++, Richard L. Halterman.

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## COURSE OUTCOMES

After completion of this course, the students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	tell the concepts of classes & objects and their significance in real world.	Skill development
2	explain the benefits of object oriented design.	Skill development
3	build C++ classes using appropriate encapsulation and design principles.	Employability
4	analyze the utilization of inheritance and	Employability

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	polymorphism in the solution of problems.	
5	choose appropriate object orient programming concepts for solving real world problems.	Entrepreneurship
6	develop solutions to problems demonstrating usage of control structures, modularity, I/O and other standard language constructs.	Entrepreneurship

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**DIGITAL ELECTRONICS  
150213 (DC-3)**

**COURSE OBJECTIVES**

- To perform the analysis and design of various digital electronic circuits.
  - To learn various number systems, boolean algebra and logic gates.
  - To understand the concept of counters, latches and flip-flops.
- 

**Unit-I**

Introduction to Digital Electronics, Needs and Significance, Different Number System: Binary Numbers, Octal and Hexadecimal Numbers, Conversions, Complement's, Signed Binary Numbers, Binary Arithmetic's, Binary Codes: BCD, ASCII Codes.

**Unit-II**

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Boolean Relations, Digital Logic Gates, De Morgan's Theorem, Karnaugh Maps and simplifications, **Prime Implicants and Essential Prime Implicants definition.**

**Unit-III**

Combinational Circuits, Half Adder, **Half Subtractor**, Full Adder and **Full Subtractor**, Binary Adder-Subtractor, Binary Multiplier, Comparator, Decoders, Encoders, Multiplexers, **Demultiplexer.**

**Unit-IV**

Sequential Circuits, Latches, Flip-Flops: RS Latches, Level Clocking, D Latches, Edge-triggered D Flip-flop, Edge-triggered JK Flip-flop, JK Master-slave Flip-flop; Registers, Shift Registers, Counters, Ripple Counters, Synchronous Counters.

**Unit-V**

Introduction to Memory, Memory Decoding, Error Detection and Correction, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices, RTL and DTL Circuits, TTL, ECL, MOS, CMOS, Application Specific Integrated Circuits.

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### **RECOMMENDED BOOKS**

- Digital Design, Morris Mano M. and Michael D. Ciletti, IV Edition, Pearson Education.
  - Digital Electronics: Principles, Devices and Applications, Anil K. Maini, Wiley.
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### **COURSE OUTCOMES**

After completion of the course students would be able to:

<b>S. No</b>	<b>COURSE OUTCOMES (COs)</b>	<b>Mapping</b>
1	explain the computer architecture for defining basic component and functional unit.	Skill development
2	recall different number system and solve the basic arithmetic operations.	Skill development
3	develop the understanding of combinational circuits.	Entrepreneurship
4	analyze the basic concept of sequential circuits.	Employability
5	compare various memories.	Skill development
6	solve the boolean functions using logic gates.	Skill development

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*Syllabi of*  
*Departmental Elective (DE-1) Courses*  
*B.Tech VI Semester*  
*(Computer Science and Engineering)*  
*Batch admitted in 2019-20*

## Department of Computer Science and Engineering

### **NETWORK & WEB SECURITY** **150611 (DE-1)**

#### **COURSE OBJECTIVES**

- To provide conceptual understanding of network security principles, issues, challenges and mechanisms.
- To understand how to apply encryption techniques to secure data in transit across data networks.
- To explore the requirements of real-time communication security and issues related to the security of web services.

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#### **Unit-I**

**Security:** Principles and Attacks, Basic Number Theory: Prime Number, Congruence's, Modular Exponentiation, Fundamentals of Cryptography, Steganography, Cryptanalysis, Code Breaking, Block Ciphers and Steam Ciphers, Substitution Ciphers, Transposition Ciphers, Caesar Cipher, Play-Fair Cipher, Hill Cipher, Cipher Modes of Operation.

#### **Unit-II**

**Cryptography:** Symmetric Key Cryptography, Public Key Cryptography, Principles of Public Key Cryptosystem, Classical Cryptographic Algorithms: DES, RC4, Blowfish, RSA, Distribution of Public Keys and Key Management, Diffie-Hellman Key Exchange.

#### **Unit-III**

**Hash Functions:** Hash Functions, One Way Hash Function, SHA (Secure Hash Algorithm). **Authentication:** Requirements, Functions, Kerberos, Message Authentication Codes, Message Digest: MD5, SSH (Secure Shell), Digital Signatures, Digital Certificates.

#### **Unit -IV**

**IP & Web Security Overview:** SSL (Secure Socket Layer), TLS (Transport Layer Security), SET (Secure Electronic Transaction). **IDS (Intrusion detection system):**

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(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to R.G.P.V. Bhopal, M.P.)

Statistical Anomaly Detection and Rule-Based Intrusion Detection, Penetration  
Testing, Risk Management. Firewalls: Types, Functionality and Policies.

## Unit -V

**Phishing:** Attacks and its Types, Buffer Overflow Attack, Cross Site Scripting, SQL Injection Attacks, Session Hijacking. Denial of Service Attacks: Smurf Attack, SYN Flooding, Distributed Denial of Service. Hacker: Hacking and Types of Hackers, Foot Printing, Scanning: Types: Port, Network, Vulnerability), Sniffing in Shared And Switched Networks, Sniffing Detection & Prevention, Spoofing.

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### RECOMMENDED BOOKS

- Cryptography and Network Security, William Stallings, Pearson Education.
- Cryptography and Network Security, Atul Kahate, McGraw Hill Education.
- Incident Response and Computer Forensics, Kevin Mandia, Chris Prosis, Tata McGraw Hill.

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### COURSE OUTCOMES

After completion of the course students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	explain cryptographic algorithms, hash algorithms and authentication mechanisms.	Skill development
2	illustrate fundamentals of number theory, attacks and security principles.	Skill development
3	apply number theory and various algorithms to achieve principles of security.	Entrepreneurship
4	analyze the cause for various existing network attacks and describe the working of available security controls.	Employability
5	examine the vulnerabilities in IT infrastructure.	Skill development
6	predict the attacks and controls associated with IP, transport-level, web and e-mail security.	Employability

Department of Computer Science and Engineering

**IMAGE PROCESSING**  
**150612 (DE-1)**

**COURSE OBJECTIVES**

- To understand the fundamentals of image acquisition, image processing in various domains.
  - To understand image transformation, enhancement and restoration techniques used in image processing.
  - To know image registration and segmentation used in image processing.
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**Unit- I**

**Introduction and Fundamentals:** Introduction to Image Processing Systems, Digital Image Fundamentals: Components of Digital Image Processing System, Image Model, Imaging Geometry, Sampling and Quantization of Images, Classification of Digital Images, Zooming and Shrinking, Relationship Between Pixels.

**Unit- II**

**Image Enhancement in Spatial Domain:** Introduction, Basic Gray Level Function, Piecewise Linear Transformation, Contrast Stretching, Histogram Specification, Histogram Equalization, Local Enhancement using Arithmetic and Logical Operation- Image Subtraction, Image Averaging Image Smoothing: Smoothing Spatial Filters, Smoothing Linear Filters, Image Sharpening.

**Unit- III**

**Image Enhancement in Frequency Domain:** Introduction to Fourier Transform, Filters: Low Pass and High Pass, Gaussian Filters, Homomorphic Filtering.

**Image Restoration-** Model of Image Degradation/Restoration Process, Noise Models, Noise Reduction in Spatial Domain and Frequency Domain, Inverse Filtering, Mean Filters, Least Mean Square(Wiener) Filtering, Fir Wiener Filter.

**Unit -IV**

**Morphological Image Processing:** Logic Operation Involving Binary Images, Dilation And Erosion, Opening and Closing, Morphological Algorithms: Boundary

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(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to R.G.P.V. Bhopal, M.P.)

Extraction, Region Filling, Extraction Of Connected Components, Convex Hull,  
Thinning, and Thickening.



### Unit -V

**Image Registration:** Introduction, Geometric Transformation, Plane to Plane Transformation, Mapping.

**Image Segmentation:** Introduction, Region Extraction, Pixel Based Approach, Multilevel Thresholding, Local Thresholding, Region Based Approach, Region Growing, Splitting and Merging, Edge and Line Detection, Corner Detection, Detection of Discontinuities, Edge Linking and Boundary Detection.

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### - RECOMMENDED BOOKS

- Digital Image Processing, Rafael C Gonzalez, Richard E Woods, Pearson Education.
  - Fundamentals of Digital Image Processing, K. Jain, Pearson Education.
  - Digital Image Processing, S. Esakkirajan, S. Jayaraman, T. Veerakumar, Tata McGraw-Hill Education.
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### COURSE OUTCOMES

After completion of this course, the students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	define different modalities and current techniques in image processing.	Skill development
2	classify spatial and frequency domain techniques used in image processing.	Skill development
3	apply image processing techniques to enhance visual images.	Entrepreneurship
4	analyse the constraints in image processing when dealing with real problems.	Employability
5	evaluate various enhancement, restoration and retrieval techniques of image processing.	Employability
6	design a system using the mathematical models and principles of digital image processing for real world problems.	Entrepreneurship

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Department of Computer Science and Engineering

**MOBILE COMPUTING**  
**150613 (DE-1)**

**COURSE OBJECTIVES**

- To introduce the basic concepts and principles in mobile computing.
  - To provide a computer systems perspective on the converging areas of wireless networking, mobile devices, and network protocols.
  - To introduce wireless communication and networking principles, that support connectivity to cellular networks, wireless internet and sensor devices.
- 

**Unit-I**

**Review of Personal Communication Services (PCS):** Basic Concepts of Cellular Systems, Global System for Mobile Communication (GSM), Protocols, Handover, Data Services, and Multiple Division Techniques.

**Unit-II**

**General Packet Radio Services (GPRS):** GPRS Architecture, GPRS Network Nodes. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 Standard. Mobile IP.

**Unit-III**

**Wireless Application Protocol (WAP):** Mobile Internet Standard. WAP Gateway and Protocols, Wireless Markup Languages (WML).

**Unit-IV**

**Third Generation (3G) Mobile Services:** Introduction to International Mobile Telecommunications 2000 (IMT 2000) Vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of Services in 3G.

**Unit-V**

**Wireless Local Loop (WLL):** Introduction to WLL Architecture, WLL Technologies. Global Mobile Satellite Systems: Case Studies of IRIDIUM and GLOBALSTAR Systems. Bluetooth Technology, Wi-Fi and Wi-Max.

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### RECOMMENDED BOOKS

- Mobile communications, J. Schiller, Pearson Education.
  - Wireless and Mobile Networks Architecture, by Yi —Bing Lin, John Wiley & Sons.
  - Mobile & Personnel Communication Systems and Services, Raj Pandya, Prentice Hall India.
  - Wireless Communication- Principles and Practices, Theodore S. Rappaport, Pearson Education.
  - The Wireless Application Protocol, Singhal & Bridgman, Pearson Education.
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### COURSE OUTCOMES

After completion of the course students would be able to:

S. No	COURSE OUTCOMES (COs)	Mapping
1	explain the basic concepts of mobile telecommunications system.	Skill development
2	demonstrate the infrastructure to develop mobile communications system.	Skill development
3	classify the different generations and technology for mobile communications.	Employability
4	examine the working of different protocols of wireless mobile communication technology.	Employability
5	determine the importance of each technology suitable for different situation of mobile	Skill development
6	develop protocols for adhoc and infrastructure based wireless networks.	Entrepreneurship

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*Syllabi of*  
*Departmental Core (DC) Courses*  
*B.Tech VI Semester*  
*(Computer Science and Engineering)*  
*Batch admitted in 2019-20*

Department of Computer Science and Engineering

**COMPILER DESIGN**  
**150601 (DC-12)**

**COURSE OBJECTIVES**

- To learn finite state machines and context free grammar.
  - To learn, various phases of compiler
  - To understand process of compiler implementation.
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**Unit-I**

**Overview of Translation Process:**

Introduction to Compiler, Major Data Structures in Compiler, Other Issues in Compiler Structure, BOOT Strapping and Porting, Compiler Structure: Analysis-Synthesis Model of Compilation, Various Phases of a Compiler, Tool Based Approach to Compiler Construction.

**Unit-II**

**Lexical Analysis:** Input Buffering, Symbol Table, Token, Recognition of Tokens, Lexeme and Patterns, Difficulties in Lexical Analysis, Error Reporting and Implementation. Regular Grammar & Language Definition, Transition Diagrams, Design of a Typical Scanner using LEX.

**Unit-III**

**Syntax Analysis:** Context Free Grammars (CFGs), Ambiguity, Basic Parsing Techniques: Top Down Parsing, Recursive Descent Parsing, Transformation on the Grammars, Predictive Parsing LL(1) Grammar, Bottom-UP Parsing, Operator Precedence Parsing, LR Parsers (SLR, CLR, LALR), Design of a Typical Parser Using YACC.

**Unit-IV**

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**Semantic Analysis:** Compilation of Expression, Control, Structures, Conditional Statements, Various Intermediate Code Forms, Syntax Directed Translation, Memory Allocation and Symbol Table Organizations, Static and Dynamic Array Allocation, String Allocation, Structure Allocation etc., Error Detection Indication and Recovery, Routines or Printing Various Lexical, Syntax and Semantic Errors.

## Unit-V

### **Code Generation and Code Optimization:**

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 Data Flow Analysis, Solution to Iterative Data Flow Equations, Code Improving Transformations, Dealing with Aliases, Data Flow Analysis of Structured Flow Graphs.

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### **RECOMMENDED BOOKS**

- Compilers: Principles, Techniques and Tools, V. Aho, R. Sethi and J. D. Ullman, Pearson Education.
  - Compiler Construction: Principles and Practice, K.C. Louden, Cengage Learning.
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### **COURSE OUTCOMES**

After completion of this course, the students would be able to:

<b>S. No</b>	<b>COURSE OUTCOMES (COs)</b>	<b>Mapping</b>
1	define the concepts of finite automata and context free grammar.	Skill development
2	build the concept of working of compiler.	Employability
3	examine various parsing techniques and their comparison.	Employability
4	compare various code generation and code optimization techniques.	Skill development
5	analyze different tools and techniques for designing a compiler.	Entrepreneurship
6	design various phases of compiler.	Employability



Department of Computer Science and Engineering

**COMPUTER NETWORKS**  
**150602 (DC-13)**

**COURSE OBJECTIVES**

- Familiarize the student with the basic taxonomy and terminology of the computer networking.
- Provide detail knowledge about various layers, protocols and devices that facilitate networking.
- Enable students to deal with various networking problems such as flow control, error control and congestion control.

**Unit-I**

**Introduction:** Computer Network, Types- LAN, MAN & WAN, Data Transmission Modes- Serial & Parallel, Simplex, Half Duplex & Full Duplex, Synchronous & Asynchronous Transmission, Transmission Medium- Guided & Unguided, Cables- Twisted Pair, Coaxial Cable & Optical Fiber, Networking Devices- Repeaters, Hub, Switch, Bridge, Router, Gateway and Modem, Performance Criteria- Bandwidth, Throughput, Propagation Time & Transmission Time, Network Standardization- OSI Reference Model & TCP/IP Reference Mode.

**Unit-II**

**Physical Layer:** Network topologies- Bus, Ring, Star & Mesh, Line Coding- Unipolar, Polar and Bipolar, Switching- Circuit Switching, Message Switching & Packet Switching, Multiplexing: FDM – Frequency Division Multiplexing, WDM – Wavelength Division Multiplexing & TDM – Time Division Multiplexing.

**Unit-III**

**Data Link Layer:** Introduction, Design Issues, Services, Framing, Error Control, Flow Control, ARQ Strategies, Error Detection and Correction, Parity Bits, Cyclic Redundant Code (CRC), Hamming Codes, MAC Sub Layer- Channel Allocation Problem, Pure

ALOHA ,Slotted ALOHA, CSMA ,CSMA/CD, IEEE 802.3, IEEE 802.4 and IEEE 802.5.

#### **Unit-IV**

**Network Layer & Transport Layer:** Introduction, Design Issues, Services, Routing- Distance Vector Routing, Hierarchical Routing & Link State Routing, Shortest Path

Algorithm- Dijkstra's Algorithm & Floyd–Warshall's Algorithm, Flooding, Congestion

Control- Open Loop & Closed Loop Congestion Control, Leaky Bucket & Token Bucket Algorithm. Connection Oriented & Connectionless Service, IP Addressing.

#### **Unit-V**

**Presentation, Session& Application Layer:** Introduction, Design Issues, Presentation Layer- Translation, Encryption- Substitutions and Transposition Ciphers, Compression- Lossy and Lossless. Session Layer – Dialog Control, Synchronization. Application Layer- Remote Login, File Transfer & Electronic Mail.

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#### **- RECOMMENDED BOOKS**

- Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill.
- Computer Networks, Andrew S. Tanenbaum, Pearson Education India.
- Computer Networks and Internets, Douglas E. Comer, Pearson India.

#### **COURSE OUTCOMES**

After completion of this course, the students would be able to:

<b>S. No</b>	<b>COURSE OUTCOMES (COs)</b>	<b>Mapping</b>
1	explain the fundamental concepts of computer network.	Skill development
2	illustrate the basic taxonomy & terminologies of computer network protocols.	Skill development
3	develop a concept for understanding advance computer network	Entrepreneurship
4	build the skill of IP addressing and routing mechanism.	Employability

5	predict the performance of computer network in congestion and internet.	Skill development
6	construct the network environment for implementation of computer networking concept.	Employability

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