JSPM's
RAJARSHI SHAHU COLLEGE OF ENGINEERING
TATHAWADE, PUNE-33
(An Autonomous Institute Affiliated to Savitribai Phule PuneUniversity,Pune)

Structure and Syllabus
for
B. Tech. Information Technology
with
Minors in "Computer Systems"

w. e. f. Academic Year 2021-2022
(2019 Pattern)

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RAJARSHI SHAHU COLLEGE OF ENGINEERING
TATHAWADE, PUNE-33
An Autonomous Institute Affiliated to
Savitribai Phule PuneUniversity,Pune

B. Tech. Information Technology
(Minors Course)
Computer Systems

Course Code	Course	Teaching Scheme			Examination Schemes						Credits
		TH	Tut	Lab	Theory			Practical		Total	Total
					ISE (15)	MSE (25)	ESE (60)	TW	Lab		
T. Y. Sem V											
ITM3101	Problem solving through Programming in C	04	-	-	15	25	60	-	-	100	04
T. Y. Sem VI											
ITM3102	Data Structure using C++	03	-	02	15	25	60	-	25	125	04
ITM3103	Database Management System	03	-	02	15	25	60	-	25	125	04
B. Tech. Sem VII or Sem VIII											
ITM4101	Computer Network and Security	04	-	-	15	25	60	-	-	100	04
ITM4102	Internet Technology	04	-	-	15	25	60	-	-	100	04
Total		**18**	**-**	**04**	**75**	**125**	**300**	**-**	**50**	**550**	**20**

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T. Y. B. Tech (Department of Information Technology)
Academic Year – 2021-2022 Semester -V
[ITM3101]: Problem solving through Programming in C

Teaching Scheme:	**Credits:**	**Examination Scheme:**
TH : 04 Hours/Week	TH : 04	In Sem. Evaluation : 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Total Marks : 100 Marks

Course Prerequisites: Basic Object-Oriented Design Concepts, Basic Discrete Mathematics Concepts.

Course Objectives:

- To impart the basic concepts of C programming.
- Translate the algorithms to programs (in C language)Study and Analyze different control structures.
- Test and execute the programs and correct syntax and logical errors
- Assess appropriate data structure during program development/Problem Solving
- To understand concepts about searching and sorting techniques

Course Outcomes: After successful completion of the course, students will able to-

CO1: Formulate simple algorithms for arithmetic and logical problems

CO2: Test and execute the programs and correct syntax and logical errors

CO3: Implement conditional branching, iteration and recursion

CO4: Decompose a problem into functions and synthesize a complete program using divide and conquer approach

CO5: Apply programming to solve matrix addition and multiplication problems and searching and sorting problems

CO6: Use arrays, pointers and structures to formulate algorithms and programs

Course Contents

UNIT-I	**Introduction**	**08 Hours**

Introduction, Idea of Algorithms , Flow Chart and Pseudocode , Introduction to Programming Language Concepts , Variables and Memory , Types of Software and Compilers , Introduction to C Programming Language , Variables and Variable Types in C , Introducing Functions , Address and

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Content of Variables and Types		
UNIT-II	**Control Structures**	**08 Hours**
Assignment Statement and Operators in C , Arithmetic Expressions and Relational Expressions , Logical Operators and Change in Control Flow , Use of Logical Operaotrs in Branching , Branching, IF - ELSE Statement, IF-ELSE Statement (Contd.) , Switch statement , Switch Statement (Contd.) and Introduction to Loops , Implementing Repetitions (Loops) , Implementation of Loops with for Statement (Contd.)		
UNIT-III	**Loops**	**08 Hours**
For Statement (Contd.) , Example of If-Else , Example of Loops , Example of Loops (Contd.) , Example of Loops (Contd.), Use of FOR Loops, Introduction to Arrays , Arrays (Contd.) , Arrays (Contd.) , Program using Arrays , Array Problem		
UNIT-IV	**Functions**	**08 Hours**
Linear Search , Character Array and Strings , String Operations , 2-D Array Operation , Introducing Functions, More on Functions , Function (Contd.) , Scanf and Printf Functions; Function Prototype , Parameter Passing in Function Revision , Parameter Passing in Function Revision (Contd.)		
UNIT-V	**Searching & Sorting**	**08 Hours**
Substitution of # include and Macro , "search" as a function , Binary Search , Binary Search (Contd.) , Sorting Methods, Bubble Sort (Contd.) , Use of Pointer in Function, Context Bubble Sort , Arrays at Strings , Data Representation , Bisection Method		
UNIT-VI	**Pointers**	**08 Hours**
Interpolation , Trapezoidal Rule and Runge-Kutta Method , Recursion , Recursion(Contd.) , Structure, Structure (Contd.) , Structure with typedef , Pointer , Pointer (Contd.) , Pointer in Structures , Dynamic Allocation and File.		

Text Books:

T1. Horowitz and Sahni, Fundamental of Data Structures, 4th Ed., CSP, 1994, (Pascal, C , C++ or Generic version)

T2. Carrano, F. M., Data Abstraction and Problem Solving with C++, Benjamin Cummings, 1995.

T3. Tenenbaum, A. M. ,Langsam, Augenstein, M. J., Data Structures Using C++, Prentice Hall, 1996.

Reference Books:

R1. Data Structures and Algorithm Analysis in C++ - By Mark Allen Weiss

R2.Object Oriented Concepts and Programming in C++ Lab Book – By Manisha Suryavanshi, Madhuri Ghanekar, S. G. Lakhdive , Parag Tamhankar and Manisha Jagdale

R3.C++ Programming- A practical approach – By Madhusudan Mothe

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T. Y. B. Tech (Department of Information Technology)
Academic Year – 2021-2022 Semester -V
[ITM3102]: Data Structure using C++

Teaching Scheme:	**Credits:**	**Examination Scheme:**
TH : 03 Hours/Week	TH : 03	In Sem. Evaluation : 15 Marks
LAB: 02 Hours/Week	LAB:01	Mid Sem. Exam : 25 Marks
		End Sem. Exam : 60 Marks
		Lab Exam :25 Marks
		Total Marks : 125 Marks

Course Prerequisites: Basic Object-Oriented Design Concepts, Basic Discrete Mathematics Concepts.

Course Objectives:

- To impart the basic concepts of C++.
- Explain fundamentals of data structures and their applications essential for programming/problem solving
- Analyze Linear Data Structures: Stack, Queues, Lists
- Analyze Non Linear Data Structures: Trees
- Assess appropriate data structure during program development/Problem Solving
- To understand concepts about searching and sorting techniques

Course Outcomes: After successful completion of the course, students will able to-

CO1: Be familiar with basics of C++.
CO2: Study and implement C++ functions and classes
CO3: Implement all data structures like stacks and Queues.
CO4: Be familiar with implementation of linked data structures such as linked lists and binary trees
CO5: Implement all data structures like trees, lists and graphs.
CO6: Ability to summarize searching and sorting techniques

Course Contents

UNIT-I	**Introduction to C++**	**08 Hours**

C++ Class Overview- Class Definition, Objects, Class Members, Access Control, Class Scope, Constructors and destructors, parameter passing methods, Inline functions, static class members, this pointer, friend functions, dynamic memory allocation and de-allocation (new and delete), exception

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handling.

UNIT-II	Functions and classes	08 Hours

Function Over Loading, Operator Overloading, Generic Programming- Function and class templates, Inheritance basics, base and derived classes, inheritance types, base class access control, runtime polymorphism using virtual functions, abstract classes, streams I/O.

UNIT-III	Stack & Queue	08 Hours

Algorithms, performance analysis- time complexity and space complexity. Review of basic data structures- The list ADT, Stack ADT, Queue ADT, Implementation using template classes in C++. Priority Queues : Definition, ADT .

UNIT-IV	Backtracking	08 Hours

Linked List Types of linked list, Representing linked list in C++, Defining a Node in C++- ,Pointer manipulation in C++- ,The Template Class , Circular Lists, Available Space Lists, Linked Stacks and Queues, Polynomials, Polynomial Representation.

UNIT-V	Search Trees	08 Hours

Binary Search Trees, Definition, ADT, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations - Insertion, Deletion and Searching Trees definitions, B-Trees, insertion, deletion and searching.

UNIT-VI	Tree and Graphs	08 Hours

The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Graph Operation, Depth First Search, Breadth First Search. Sorting : Insertion Sort, Quick Sort, Merge Sort ,Heap Sort

Lab Contents

Guidelines for Lab Assessment

1) Continuous assessment shall be based on experiments performed, submission of results of practical assignments in the form of journal / reports, timely completion, attendance, understanding, performance.
2) Practical / Oral examination shall be based on the practical's performed in the lab.
3) Lab assessment marks shall be based on continuous assessment and performance in Practical/Oral examination.

List of Laboratory Assignments

1	Overview of C++, and programs to demonstrate C++ classes and templates
2	Implementation of Array and String operations.
3	Programs for implementation of Stack and Queues using Arrays
4	Write a C++ program that uses functions to perform create, insert ,delete and display
5	Write a C++ program that uses functions to perform the following: a) Create a binary search tree of characters.

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	b) Traverse the above Binary search tree .
6	Write a C++ program that uses function templates to perform to Search for a key element in a list of elements using linear search.
7	Programs to implement Tree Traversals using Graphs Search Methods
8	Write a C++ program that implements Insertion sort algorithm to arrange a list of integers in ascending order
9	Write a template based C++ program that implements selection sort algorithm to arrange a list of elements in descending order.

Text Books:

T1. Horowitz and Sahni, Fundamental of Data Structures, 4th Ed., CSP, 1994, (Pascal, C , C++ or Generic version)

T2. Carrano, F. M., Data Abstraction and Problem Solving with C++, Benjamin Cummings, 1995.

T3. Tenenbaum, A. M. ,Langsam, Augenstein, M. J., Data Structures Using C++, Prentice Hall, 1996.

Reference Books:

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R2:Object Oriented Concepts and Programming in C++ Lab Book – By ManishaSuryavanshi, MadhuriGhanekar, S. G. Lakhdive , ParagTamhankar and ManishaJagdale

R3:C++ Programming- A practical approach – By MadhusudanMothe

R4: C++ Programming Language – By D. S. Malik

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T. Y. B. Tech (Department of Information Technology)
Academic Year – 2021-2022 Semester -V
[ITM3103]: Database Management Systems

Teaching Scheme:	Credits:	Examination Scheme:
TH : 03 Hours/Week PR : 02 Hours/Week	TH : 03 LAB : 01	In Sem. Evaluation : 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Lab Exam : 25 Marks

Course Prerequisites: Data structures , Discrete structures.

Course Objectives:

- Learn the fundamental concepts of database management.
- Provide a strong formal foundation in database concepts, technology and practice.
- Study the basic issues of transaction processing and concurrency control.
- Learn and understand various Database Architectures.
- Understand how analytics and big data affect various functions now and in the future.

Course Outcomes: After successful completion of the course, students will able to-

CO1: Describe database concepts and analyze database models
CO2: Design a database schema for a given problem-domain
CO3: Create, populate and query a database using SQL and PL/SQL
CO4: Describe and compare transaction schedules and concurrency control techniques
CO5: Elaborate concepts of parallel and distributed databases
CO6: Describe Data warehouse and data mining concepts

Course Contents

UNIT-I	Introduction	07 Hours

Database Concepts, Database System Architecture, Data Modeling : Data Models, Basic Concepts, entity, attributes, relationships, constraints, keys, E-R and EER diagrams: Components of E-R Model, conventions, converting E-R diagram into tables, EER Model components, converting EER diagram into tables, Relational Model: Basic concepts, Attributes and Domains,
Relational Integrity: Domain, Entity, Referential Integrities, Enterprise Constraints, Views, Schema Diagram

UNIT-II	Database Design, Normalization and Relational Algebra	07 Hours

Database Design: Functional Dependency, Purpose of Normalization, Data Redundancy and Update

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Anomalies, Functional Dependency-Single Valued Dependencies.

Single Valued Normalization: 1NF, 2NF, 3NF, BCNF. Decomposition: lossless join decomposition and dependency preservation.

Relational Algebra: Basic Operations, Selection, projection, joining, outer join, union, difference, intersection, Cartesian product, division operations

UNIT-III	SQL And PL/SQL	07 Hours

Introduction to SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, DCL, TCL, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, Nulls SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries, roles and privileges , concept of Stored Procedures, Cursors, Triggers

UNIT-IV	Database Transactions and Concurrency Control	07 Hours

Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule,

Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non recoverable Schedules, Checkpoints

Concurrency Control: Need, Locking Methods, Deadlocks, Time-stamping Methods, and Optimistic Techniques.

UNIT-V	Parallel and Distributed Database Concepts	07 Hours

Database Architectures: Centralized and Client-Server Architectures, 2 Tier and 3 Tier Architecture, Introduction to Parallel Databases, Key elements of Parallel Database Processing, Architecture of Parallel Databases, Basics of Query processing in parallel databases.

Introduction to Distributed Databases, Architecture of Distributed Databases, Distributed Database Design, Query processing in Distributed databases.

UNIT-VI	Data Warehousing and Data Mining	07 Hours

Data Warehousing : Introduction, Evolution of Data Warehouse, Characteristics, Benefits, Limitation of Data Warehousing, Main Components of Data Warehouse, Conceptual Models, Data Mart, OLAP, Data Mining : Process, Knowledge Discovery, Goals of Data Mining, Data Mining Tasks.

Lab Contents

Guidelines for Assessment

1) Continuous assessment shall be based on experiments performed, submission of results of practical assignments in the form of journal / reports, timely completion, attendance, understanding, performance.

2) Practical / Oral examination shall be based on the practical's performed in the lab.

3) Lab assessment marks shall be based on continuous assessment and performance in Practical/Oral examination.

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List of Laboratory Assignments	
1	Study and design a database with suitable example using following database systems: • Relational: SQL / PostgreSQL / MySQL • Key-value: Riak / Redis • Columnar: Hbase • Document: MongoDB / CouchDB Compare the different database systems based on points like efficiency, scalability, characteristics and performance.
2	Install and configure client and server for MySQL (Show all commands and necessary steps for installation and configuration)
3	Design any database with at least 3 entities and relationships between them. Apply DCL and DDL commands. Draw suitable ER/EER diagram for the system
4	Design and implement a database and apply at least 10 different DML queries for the following task. For a given input string display only those records which match the given pattern or a phrase in the Search string. Make use of wild characters and LIKE operator for the same. Make use of Boolean and Arithmetic operators wherever necessary
5	Execute the aggregate functions like count, sum, avg etc. on the suitable database. Make use of built in functions according to the need of the database chosen. Retrieve the data from the database based on time and date functions like now (), date (), day (), time () etc. Use group by and having clauses
6	Implement nested sub queries. Perform a test for set membership (in, not in), set comparison and set cardinality
7	Write and execute triggers with suitable database. Consider row level and statement level triggers
8	Write and execute PL/SQL stored procedures and functions using cursor with suitable database

Text Books:

T1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", 6thEdition, McGraw Hill Publishers, ISBN 0-07-120413-X

T2. S.K.Singh, “Database Systems : Concepts, Design and Application”, 2nd Edition, Pearson, 2013,ISBN 978-81-317-6092-5.

T3. Connally T., Begg C., "Database Systems", 3rd Edition, Pearson Education, 2002, ISBN 81-7808-861-4

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Reference Books:

R1. Kristina Chodorow, Michael Dirolf, "MangoDB: The Definitive Guide" ,O'Reilly Pubications
R2. Tom White, "Hadoop: The Definitive Guide", O'Reilly Pubications
R3. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", Elsevier
R4. Bill Schmarzo, "Big Data:Understanding How Data Powers Big Business", Wiley,ISBN:978-81- 265-4545-2
R5. Alex Holmes, "Hadoop in Practice", DreamTech Press, ISBN : 978-93-5119-150-6

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T.Y.B. Tech (Department of Information Technology)
Academic Year – 2022-2023 Semester -VII
[ITM4101]: Computer Networking and Security

Teaching Scheme:	**Credits:**	**Examination Scheme:**
TH : 04/Week	TH : 04	In Sem. Evaluation : 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Total Marks : 100 Marks

Course Prerequisites: Basic knowledge of Computer Programming, Basic knowledge of Computer Organization, Fundamentals of Computer Communication.

Course Objectives:

- To familiarize students with basic concepts and types of networks.
- To understand ISO/OSI model and TCP/IP model
- To understand data link, network layer of ISO/OSI Model.
- To understand transport and application layer ISO/OSI Model.
- To study Wireless network.

Course Outcomes: After successful completion of the course, students will able to-

CO1: Explain principles and working of data communication and computer communication
CO2: Explain principles and working of mobile and wireless communication.
CO3: Understand and Analyze the Concepts of Network layer and it's Protocols.
CO4: Understand and Analyze the Concepts Network security.
CO5 : Understand and Analyze the Concepts of authentication process.
CO6 : Understand Concepts of biometric security.

Course Contents

UNIT-I	**Introduction To Computer Networks**	**07 Hours**
Introduction: Definition of a Computer Network; What is a Network?, Components of a computer network: Use of Computer networks. Classification of networks; Internet Reference Models (OSI and TCP/IP).		
UNIT-II	**Physical Layer and Data Link Layer**	**07 Hours**
Basis for Data Communication, Guided Transmission Media , Wireless Transmission Medium, Circuit Switching and Telephone Network, High Speed Digital Access .Data Link Layer Design Issues, Error Detection and Correction, Data Link Control and Protocols, Example Data Link Protocol.		
UNIT-III	**Network Layer and Transport layer**	**07 Hours**

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Design Issues in Network Layer, Network Layer protocols: IPv4, Routing algorithms (Routing in the Internet: Introduction to Intra-domain and inter-domain routings, Static Routing Protocols, Dynamic Routing Protocols), Internetworking. Interior and exterior routing protocols. Transport Layer Service, Elements of Transport protocols, Internet protocols (UDP and TCP).		
UNIT-IV	**Application Layer**	**07 Hours**
Principles of Application Layer Protocols, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS – the Internet's Directory Service.		
UNIT-V	**Cryptography**	**07 Hours**
Need for Security, Security Attacks, Services and Mechanisms, Network Security, Model. Public Key Cryptography- Need and Principles of Public Key Cryptosystems, RSA Algorithm Data Encryption Standard (DES),Advanced Encryption Standard (AES) , Public-Key Cryptography :RSA Algorithm		
UNIT-VI	**Network Security**	**07 Hours**
Firewalls-Firewalls and Intrusion Detection Systems: Intrusion Detection Password Management, Firewall Characteristics Types of Firewalls, Firewall Basing, Firewall Location and Configurations. IP Security, Web Security, SSL, TLS.		

Text Books:

T1 : Behrouz A. Forouzan, "Data Communications and Networking‖ MacGraw Hill, 5th edition

T2 : James F. Kurouse& W. Rouse, —Computer Networking: A Top down Approach‖, 6thEdition, Pearson Education.

T3 : Forouzan "Cryptography & Network Security", PHI 4".

T4: Cryptography and Network Security: Principles and Practice, 6th Edition, William Stallings, 2014, Pearson, ISBN13:9780133354690**.**

Reference Books :

R1. Behrouz A. Forouzan, TCP/IP Protocol Suite, McGraw Hill Education, ISBN: 978-0-07-070652-1, 4th Edition.

R2. A. S. Tanenbaum, "Computer Networks", Pearson Education, 4th Edition.

R3. Natalia Olifer, Victor Olifer, —Computer Networks‖ Wiley Student Edition

R4. Wenbo Mao,"Modern Cryptography, Theory & Practice", Pearson Education.

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B. Tech (Department of Information Technology)
Academic Year – 2022-2023 Semester -VIII
[ITM4102]: Internet Technology

Teaching Scheme:	Credits:	Examination Scheme:
TH : 04 Hours/Week	TH : 04	In Sem. Evaluation : 15 Marks Mid Sem. Exam : 25 Marks End Sem. Exam : 60 Marks Total : 100 Marks

Course Prerequisites: Basics of computer programming, Web technology

Course Objectives:

- Learn the concepts of internet technology.
- Learn to design static web pages using HTML and CSS.
- Learn to design Client-side scripting.
- Learn the concepts of dynamic web site development
- Learn different search engines.

Course Outcomes: After successful completion of the course, students will able to-

CO1: Explain the basic terminologies of Internet Technology.

CO2: Design static webpage using basic concepts of the HTML and CSS.

CO3: Write Client-side scripting logic and script using java script.

CO4: Apply methods and properties of various objects and components of PHP in dynamic website.

CO5: Understand and analyze different search engines.

Course Contents

UNIT-I	Introduction	07 Hours

Introduction to WWW, Internet, History of Internet, Internet Service Provider (ISP), Client/Server Architecture, Extranet and Internet.
World Wide Web:
Domain and Sub domain, Address Resolution, DNS, Telnet, FTP, HTTP, web browser, Web Server.
Web Design: Web site design principles, planning the site and navigation

UNIT-II	Basics of HTML	07 Hours

Introduction, Editors, Elements, Attributes, Heading, Paragraph. Formatting, Link, Head, Table, List, Block, Layout.
HTML Form, Form Elements and its methods, properties and events(Text, Text Area, Password, Button, Radio, Checkbox, List box, Reset and Submit buttons)

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UNIT-III	Apply CSS into webpage	07 Hours
Need for CSS, Introducing CSS, CSS Types (Inline Style, Embedded Style, Linked Style), using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists.		
UNIT-IV	**Java Script**	**07 Hours**
Client-side scripting, what is JavaScript, Statements, comments, variable, comparison, condition, switch, loop, break. Object – string, array, Boolean, Function, Errors, Validation.		
UNIT-V	**PHP**	**07 Hours**
Script on server side, Arrays, function and forms, advance PHP Databases : Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables,		
UNIT-VI	**Search Engines**	**07 Hours**
Search Engine and Web Crawler: Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.		

Text Books:

T1. Web Enabled commercial application development using HTML, DHTML, JavaScript, Perl, CGI, Ivan Bayross, BPB Publication

T2. Internet and Intranet Engineering; Daniel Minoli, MGraw-Hill India Limited, New Delhi, 2009.

Reference Books:

R1. Steven Holzner,"HTML Black Book" Dremtech press.

R2. Web Applications : Concepts and Real-World Design, Knuckles, Wiley-India

R3. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel. Pearson.

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