Second Year (Lateral Entry) Curriculum

Admission Year 2026-27

Bachelor of Technology (Lateral Entry)
Artificial Intelligence and Data Science

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

Course: BTech **Semester:** 3

Prerequisite: Computer Programming and Basic Syntaxes

Rationale : Data structure is a subject of primary importance in Information and Communication Technology. Organizing or structuring data is important for implementation of efficient algorithms and program development. Efficient problem solving needs the application of appropriate data structure during program development.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	-	-	-	3	20	20	-	60	-	100

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**Introduction:**Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, dynamically allocated arrays. Performance analysis of an algorithm and space and time complexities	10	6
2	**Stacks, Recursion and Queue:Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Recursion -**Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Deque, Priority Queues and its Application.	15	8
3	**Linked Lists:**Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion In Singly Linked List, Doubly Linked lists, Circular linked lists. Implementation of Stacks and Queues using Linked List.	10	5
4	**Searching and Sorting:Searching:** Linear Search, Binary Search, and Interpolation Search. **Sorts:** Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort.	10	5
5	**Trees:**Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - In Order, Post Order, Pre Order; Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Height of tree, Evaluation of Expression, Balanced Binary Tree and its operations.	15	9
6	**Red Black Trees and AVL Trees:**AVL tree Construction, Operations on AVL Trees, Introduction to Red Black Tree, and Operations on Red Black Trees.	10	4
7	**Hashing:**Hash Table organizations, Hashing Functions, Static and Dynamic Hashing	15	3
8	**Graphs:**Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search.	15	5
	Total	100	45

Reference Books

1.	**Fundamentals of Data Structures in C, 2ND eDITION, E.Horowitz, S,.Sahni and Susan Anderson- Freed, Universities Press (TextBook) (TextBook)**
2.	**Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.**

Course Outcome

After Learning the Course the students shall be able to:
Apply basic data structure operations on arrays, structures, and unions to solve computational problems. Implement stack operations using static and dynamic arrays and apply stacks to solve expression evaluation and notation conversion problems. Analyze memory management issues including garbage collection in linked list implementations. Implement and compare sorting algorithms including selection sort, insertion sort, bubble sort, quick sort, and merge sort. Construct and perform operations on AVL trees to maintain height-balanced binary search trees.

Course: BTech **Semester:** 3

Prerequisite: Basic knowledge of Data Structures

Rationale : This course provides a broad introduction to Data Structures The various Data structures and its analysis of working design and development.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
-	-	4	-	2	-	-	20	-	30	50

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Outcome

After Learning the Course the students shall be able to:
After Learning the course the students shall be able to: 1. Use different types of data structures, operations and algorithms 2. Apply searching and sorting operations on files 3. Use stack, Queue, Lists, Trees and Graphs in problem solving 4. Implement all data structures in a high-level language for problem solving

List of Practical

1.	**Implement Stack and its operations like (creation push pop traverse peek search) using linear data structure**
2.	**Implement Infix to Postfix Expression Conversion using Stack**
3.	**Implement Postfix evaluation using Stack.**
4.	**Implement Towers of Hanoi using Stack.**
5.	**Implement queue and its operations like enqueue, dequeue, traverse, search.**
6.	**Implement Single Linked lists and its operations(creation insertion deletion traversal search reverse)**
7.	**Implement Double Linked lists and its operations(creation insertion deletion traversal search reverse)**
8.	**Implement Circular Linked lists and its operations(creation insertion deletion traversal search reverse)**
9.	**Implement Linear Search, binary search and interpolation search.**
10.	**Implement Bubble sort, selection sort, Insertion sort, quick sort , merge sort.**
11.	**Implement Binary search Tree and its operations (creation, insertion, deletion).**
12.	**Implement Traversals Preorder, Inorder, Postorder on BST.**
13.	**Implement Graphs and represent using adjacency list and adjacency matrix and implement basic operations with traversals (BFS and DFS).**

Course: BTech **Semester:** 3

Prerequisite: Fundamentals of Computer Systems

Rationale : This course is an introduction to the theory and practice behind modern computer operating systems. Topics will include what an operating system does (and doesn't) do, system calls and interfaces, processes, concurrent programming, resource scheduling and management, virtual memory, deadlocks, algorithms, programming, and security. The approach of the subject is from both a theoretical perspective as well as a practical one.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
					Internal Marks			External Marks		
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	T	CE	P	T	P	
3	-	-	-	3	20	20	-	60	-	100

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**INTRODUCTION:** Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered,Monolithic, Microkernel Operating Systems, Concept of Virtual Machine	10	4
2	**PROCESSES, THREAD & PROCESS SCHEDULING** Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads. Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre- emptive, FCFS, SJF, RR.	23	11
3	**INTER-PROCESS COMMUNICATION:** Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Petersoṅ s Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Readeṙ s & Writer Problem, Dinning Philosopher Problem etc	15	7
4	**DEADLOCKS:** Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Bankeṙ s algorithm, Deadlock detection and Recovery.	12	5
5	**MEMORY MANAGEMENT & VIRTUAL MEMORY:** Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation, Fixed and variable partition, Internal and External fragmentation and Compaction; Paging: Page allocation, Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory, Hardware and control structures, Locality of reference, Page fault , Working Set , Dirty page/Dirty bit, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).	20	10
6	**I/O SYSTEMS, FILE & DISK MANAGEMENT:**I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software. File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Disk Management: Disk structure, Disk scheduling algorithms - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks	20	8
	Total	100	45

Reference Books	
1.	**Operating System Concepts Essentials (TextBook)** By byAviSilberschatz, Peter Galvin,Greg Gagne | 9th Edition Wiley Asia Student Edition.
2.	**Operating Systems Internals and Design Principles** By William Stallings; PHI; 5th Edition | PHI | 5th Edition
3.	**Operating System: A Design-oriented Approach** By Charles Crowley, | 1st Edition - Irwin Publishing
4.	**Operating Systems: A Modern Perspective (TextBook)** By by Gary J. Nutt | Addison-Wesley; 2nd Edition | 2nd Edition
5.	**Design of the Unix Operating Systems** By Maurice Bach, | Prentice-Hall of India | 8th Edition
6.	**Understanding the Linux Kernel** By Daniel P. Bovet, Marco Cesati, | O'Reilly and Associates | 3rd Edition

Course Outcome

After Learning the Course the students shall be able to:

After Learning the Course the students shall be able to:
1. Distinguish different styles of operating system design.
2. Understand device and I/O management functions in operating systems as part of a uniform device abstraction.
3. Understand disk organization and file system structure
4. Give the rationale for virtual memory abstractions in operating systems.
5. Understand the main principles and techniques used to implement processes and threads as well as the different algorithms for process scheduling.
6. Understand the main mechanisms used for inter-process communication.

Course: BTech **Semester:** 3

Prerequisite: : Data Structures and Algorithms, Good working knowledge of C, and Fundamentals of Computer Systems

Rationale : This course is an introduction to the theory and practice behind modern computer operating systems. Topics will include what an operating system does (and doesn't) do, system calls and interfaces, processes, concurrent programming, resource scheduling and management, virtual memory, deadlocks, and algorithms, programming, and security. We will approach the subject from both a theoretical perspective as well as a practical one

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
					Internal Marks			External Marks		
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	T	CE	P	T	P	
-	-	2	-	1	-	-	20	-	30	50

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Outcome

After Learning the Course the students shall be able to:
1. Experiment with Linux commands and shell programming.
2. Able to build shell program for process and file system management with system calls.
3. Able to implement and analyse the performance of CPU scheduling algorithm.
4. Able to implement and analyse the performance of page replacement algorithms.
5. Able to implement and analyse the performance of deadlock avoidance and detection algorithm.

List of Practical

1.	**Study of Basic commands of Linux.**
2.	**Study the basics of shell programming.**
3.	**Write a Shell script to print given numbers sum of all digits.**
4.	**Write a shell script to validate the entered date. (eg. Date format is: dd-mm-yyyy).**
5.	**Write a shell script to check entered string is palindrome or not.**
6.	**Write a Shell script to say Good morning/Afternoon/Evening as you log in to system.**
7.	**Write a C program to create a child process.**
8.	**Finding out biggest number from given three numbers supplied as command line arguments.**
9.	**Printing the patterns using for loop.**
10.	**Shell script to determine whether given file exist or not.**
11.	**Write a program for process creation using C. (Use of gcc compiler.**
12.	**Implementation of FCFS &Round Robin Algorithm**
13.	**Implementation of Banker's Algorithm**

Course: BTech **Semester:** 3

Prerequisite: Basic knowledge of Problem Solving,

Rationale : This course introduces Java programming and object-oriented concepts to build a strong foundation for developing reliable, platform-independent software applications and for pursuing advanced studies in software development.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	-	-	-	3	20	20	-	60	-	100

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**Overview of OOP and Java:**Programming Paradigms, Procedural vs Object-Oriented Programming, OOP Features, History of Java, Feature of Java, JVM Architecture, JRE, JDK, Java Program Structure, Compilation and Execution Process, Java Environment Setup, JDK Installation, PATH and CLASSPATH, Introduction to IDEs.	10	4
2	**Java Language Basics:**Variables, Scope of Variables, Primitive Data Types, Reference Data Types, Type Casting, Wrapper Classes, Autoboxing and Unboxing, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Unary Operators, Bitwise Operators, Operator Precedence, if Statement, if-else Statement, Nested if, switch Statement, for Loop, while Loop, do-while Loop, for - Each Loop, break Statement, continue Statement.	15	7
3	**Arrays and String**Arrays, One-Dimensional Arrays, Multi-Dimensional Arrays, Array Operations, String Class, StringBuffer, StringBuilder, String Comparison, String Manipulation Methods	12	6
4	**Object-Oriented Programming (OOP)**Classes and Objects, Constructors, Access Specifiers, Encapsulation, Inheritance, Types of Inheritance, super Keyword, Polymorphism, Method Overloading(Compile time Polymorphism), Method Overriding (Runtime Polymorphism), Abstraction, Abstract Classes, Interfaces, Functional Interfaces, this Keyword, final Keyword, Object Class and its Methods.	30	12
5	**Exception Handling**Errors and Exceptions, Checked Exceptions, Unchecked Exceptions, try-catch Block, Multiple catch Blocks, finally Block, throw Keyword, throws Keyword, Custom Exceptions, Exception Handling, Best Practices	15	6
6	**Collection Frame work in Java**Introduction to Collections Framework, List Interface, ArrayList, LinkedList, Set Interface, HashSet, TreeSet, Map Interface, HashMap, TreeMap, Iterators, Generics	10	5
7	**Advanced Foundations and Java Frameworks**Process Vs Thread, Thread Creation, Thread Life Cycle, Multithreading Concepts, Synchronization, Inter-thread Communication, File Handling, File Class, Byte Streams, Character Streams, Buffered Streams, Serialization, Deserialization, Lambda Expressions, Stream API, Optional Class.	8	5
	Total	100	45

Reference Books	
1.	**Java: The Complete Reference** By Herbert Schildt | Tata McGraw Hill | 7TH
2.	**Object Oriented Programming Through Java — P. Radha Krishna Publisher: Universities Press (India) Pvt. Ltd. (TextBook)**
3.	**Thinking in Java — Bruce Eckel Publisher: Prentice Hall (Pearson)**
4.	**Core Java, Volume I & Volume II — Cay S. Horstmann & Gary Cornell Publisher: Prentice Hall / Pearson**
5.	**JAVA8 Core Java Black Book — R. Nageswara Rao Publisher: Black Book Series (Dreamtech Press) (TextBook)**

Course Outcome

After Learning the Course the students shall be able to:

1. Develop and execute basic Java programs by following standard program structure and compilation steps.
2. Apply arithmetic, relational, logical, assignment, unary, and bitwise operators while considering operator precedence.
3. Create and manipulate one-dimensional and multi-dimensional arrays and perform common array operations in Java.
4. Analyze and handle runtime errors using Java exception handling mechanisms to develop robust and reliable applications.
5. Design and use custom exceptions and apply exception-handling best practices in Java programs.
6. Develop Java applications using advanced features such as multithreading, file handling, modern Java APIs, and demonstrate awareness of Java frameworks.

Course: BTech **Semester:** 3

Prerequisite: Basic knowledge of Problem Solving,

Rationale : This course introduces Java programming and object-oriented concepts to build a strong foundation for developing reliable, platform-independent software applications and for pursuing advanced studies in software development.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
-	-	2	-	1	-	-	20	-	30	50

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Outcome

After Learning the Course the students shall be able to:

1. Develop basic Java programs demonstrating program structure, variables, data types, type casting, operators, and control statements.
2. Implement iterative and recursive solutions using looping constructs, methods, and recursion to solve computational problems.
3. Design and manipulate one-dimensional and multi-dimensional arrays and perform array-based applications such as sorting, searching, and matrix operations.
4. Apply string handling techniques using String, StringBuffer, and StringBuilder classes and solve string-based problems.
5. Develop object-oriented Java programs using classes, objects, constructors, inheritance, polymorphism, abstraction, encapsulation, and keywords such as this and super.
6. Implement advanced Java features including exception handling, custom exceptions, collections framework, and multithreading for robust application development.

List of Practical	
1.	Write a Java program to display “Hello World” and demonstrate the Java program structure and demonstrate use of variables, data types, and type casting.
2.	Write a Java program to perform arithmetic, relational, and logical operations, bitwise and other operators.
3.	Write a Java program using below conditional statements. a) Even or Odd using if.. else statement. b) Roots of Quadratic Equation using else if ladder. c) Largest of three numbers using nested if else. d) Find out the week day using switch statement.
4.	Write a Java program to demonstrate looping constructs: a) Reverse of a number using while loop. b) Prime number using do while loop. c) nth term of fibonacci sequence using for loop.
5.	Write a Java program to perform methods and example on recursion.
6.	Write a Java program to perform operations on one-dimensional and multi-dimensional arrays.
7.	Write a Java program to demonstrate 1D - Arrays & 2-D Arrays. a) Maximum value and Second Maximum value without duplicates. b) Sort the names in Ascending Order. c) Addition of two matrix. d) 3x3 Matrix Multiplication.
8.	Write a Java program to demonstrate string handling using String, StringBuffer, and StringBuilder.
9.	Write a Java program to check the word is palindrome or not.
10.	Write a Java program to create a class and object and demonstrate constructors.
11.	Write a Java program to demonstrate encapsulation using access specifiers.
12.	Write a Java program to demonstrate inheritance: a) Single Inheritance. b) MultiLevel Inheritance. c) Hierarchial Inheritance. d) Hybrid Inheritance.
13.	Write a Java program to demonstrate use of the this and super keywords
14.	Write a Java program to demonstrate polymorphism (method overloading and overriding).
15.	Write a Java program to implement abstraction using abstract classes and interfaces(Multiple Inheritance).
16.	Write a Java program to demonstrate exception handling using try-catch-finally blocks.
17.	Write a Java program to demonstrate exception handling using try-catch-finally blocks.
18.	Write a Java program to implement List interface using ArrayList and LinkedList.
19.	Write a Java program to implement Set interface using HashSet and TreeSet.
20.	Write a Java program to implement Queue interface using Priority Queue and Deque.
21.	Write a Java program to implement map interface using HashMap and LinkedHashMap.
22.	Write a Java program to demonstrate multithreading using Thread class and Runnable interface.

Course: BTech **Semester:** 4

Prerequisite: Basic Computer Knowledge

Rationale : The course will enable students to understand the different issues involved in the design and implementation of a database system as well execute various database queries using SQL.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	-	-	-	3	20	20	-	60	-	100

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**Introduction to Database Management system and ER Model**Introduction and applications of DBMS, File Processing System and its limitations, ANSI/SPARC Model, Data Independence, Client-Server Architecture, Users & DBA, Database Architecture. Data Model,,ER Model: Entities, Attributes & its types, Relationships, Mapping Cardinalities, Participation Constraints, Weak Entity Sets, Specialization, Generalization, Aggregation, ER Diagram, Design Issues, Extended E-R Features	15	6
2	**SQL and PL SQL**Data Definition Language (DDL) commands, Data Manipulation Language (DML) commands, Data Control Language (DCL) commands, Transaction Control Language (TCL) commands. **Predicates & Clauses:** Logical Operators (AND / OR), Relational Operators, BETWEEN Predicate, IN & NOT IN Predicate, LIKE Predicate. **Functions in SQL**: Aggregate Functions, Character Functions, Arithmetic Functions, Date Functions, Conversion Functions. **PL/SQL Concepts:** Views, PL/SQL Block, Cursors, Triggers, Stored Procedures, Store Functions	15	6
3	**Relational Database Design:Relational Data Model:** Introduction, Degree, Cardinality. **Constraints & Keys:** Primary Key, Foreign Key, Super Key, Candidate Key, Not Null Constraint, Check Constraint. **Relational Algebra Operations:** Selection, Projection, Cross-Product, Rename, Joins (Natural & Outer Join), Set Operators (Union, Intersection, Set Difference), Aggregate Functions. **Functional Dependency** − Basic concepts, Attributes and Domains, CODD's Rules. Relational Integrity: Domain, Referential Integrities, Enterprise Constraints. Database Design: Features of Good Relational Designs, Normalization, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Algorithms for Decomposition, 2NF, 3NF, BCNF, , 4NF, 5NF	20	10
4	**Transaction:Transaction:** Introduction, ACID Properties, Transaction Life Cycle, Scheduling, Serial Schedule, Interleaved Schedule, Transaction Operations, Serializability (View & Conflict), Two-Phase Commit Protocol. **Database Recovery:** Introduction, Log Based Recovery, Shadow Paging, Checkpoints. **Concurrency Control:** Introduction, Lock Based Protocol, Two Phase Lock Protocol, Intention Locking, Multiple Granularity, Time-based Protocol. **Deadlock:** Introduction, Deadlock Detection, Deadlock Recovery, Deadlock Prevention (Wait-Die, Wound-Wait & Timeout-Based Approach).	20	10
5	**Query Processing and SecurityQuery Processing:** Introduction, Layers of Query Processing, Measures of Query Cost. **Security: Security:** Data Security, Data Integrity, Authentication, Authorization, Encryption, Decryption, Access Control (DAC, RBAC, MAC), Intrusion Detection, SQL Injection	20	5
6	**Emerging Database Technologies:**Introduction to No SQL Databases- Internet Databases, Cloud Databases, Mobile Databases, SQLite Database, XML Databases, MongoDB. Introduction to Big Data and XML: DTD, XML Schemas, XQuery, XPath.	10	5
	Total	100	42

Reference Books	
1.	**Database System Concepts** By Silberschatz, Korth, Sudarshan | McGraw Hill Publication | 4th Edition
2.	**An Introduction to Database Systems** By C. J. Date, A. Kannan, S. Swamynathan | Pearson Education | 8th Edition
3.	**SQL, PL/SQL – The Programming Language (TextBook)** By Ivan Bayross | BPB Publications
4.	**The Definitive Guide to MongoDB", David Hows, Peter Membrey, Eelco Plugge, Tim Hawk, Apress, Second Edition. (TextBook)**
5.	**Kevin Roebuck, "Storing and Managing Big Data - NoSQL, HADOOP and More", Emereopty Limited, ISBN: 1743045743, 9781743045749 (TextBook)**
6.	**Joy A. Kreibich, "Using SQLite", O'REILLY, ISBN: 13:978-93-5110-934-1 (TextBook)**

Course Outcome
After Learning the Course the students shall be able to:
1. Analyze and Design Database management system using ER Model. 2. Implement database queries using SQL Concepts 3. Build proper structured database using Normal forms 4. Learn how various transactions are managed in real-time scenarios. 5. Understand the evaluation parameters of a query as well as security parameters of database. 6. Use large scale databases for processing data processing.

Course: BTech **Semester:** 4

Prerequisite: Basic Computer Knowledge

Rationale : The course will enable students to understand the different issues involved in the design and implementation of a database system as well execute various database queries using SQL.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
-	-	2	-	1	-	-	20	-	30	50

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Outcome

After Learning the Course the students shall be able to:

1. Understand basic concepts of Database.
2. Understand Relational Models and its importance.
3. Build proper structured database for a given problem or application.
4. Learn how various transactions are managed in real-time scenarios.
5. Understand the evaluation parameters of a query as well as security parameters of database.
6. Implement SQL concepts to build dynamic database applications.

List of Practical

1. **To study DDL-create and DML-insert commands.**

Create tables according to the following definition.

CREATE TABLE DEPOSIT (ACTNO VARCHAR2(5) ,CNAME VARCHAR2(18) , BNAME VARCHAR2(18) , AMOUNT NUMBER(8,2) ,ADATE DATE);

CREATE TABLE BRANCH(BNAME VARCHAR2(18),CITY VARCHAR2(18)); CREATE TABLE CUSTOMERS(CNAME VARCHAR2(19) ,CITY VARCHAR2(18));

CREATE TABLE BORROW(LOANNO VARCHAR2(5), CNAME VARCHAR2(18), BNAME VARCHAR2(18), AMOUNT NUMBER (8,2));

Insert the data as shown below
DEPOSIT
ACTNO CNAME BNAME AMOUNT ADATE 100 ANIL VRCE 1000.00 1-MAR-95 101 SUNIL AJNI 5000.00 4-JAN-96 102 MEHUL KAROLBAGH 3500.00 17-NOV-95 104 MADHURI CHANDI 1200.00 17-DEC-95 105 PRMOD M.G.ROAD 3000.00 27-MAR-96 106 SANDIP ANDHERI 2000.00 31-MAR-96 107 SHIVANI VIRAR 1000.00 5-SEP-95 108 KRANTI NEHRU PLACE 5000.00 2-JUL-95 109 MINU POWAI 7000.00 10-AUG-95
BRANCH
VRCE NAGPUR AJNI NAGPUR KAROLBAGH DELHI CHANDI DELHI DHARAMPETH NAGPUR M.G.ROAD BANGLORE ANDHERI BOMBAY VIRAR BOMBAY NEHRU PLACE DELHI POWAI BOMBAY
CUSTOMERS
ANIL CALCUTTA SUNIL DELHI MEHUL BARODA MANDAR PATNA MADHURI NAGPUR PRAMOD NAGPUR SANDIP SURAT SHIVANI BOMBAY KRANTI BOMBAY NAREN BOMBAY
BORROW

LOANNO CNAME BNAME AMOUNT 201 ANIL VRCE 1000.00 206 MEHUL AJNI 5000.00 311 SUNIL DHARAMPETH 3000.00 321 MADHURI ANDHERI 2000.00 375 PRMOD VIRAR 8000.00 481 KRANTI NEHRU PLACE 3000.00

From the above given tables perform the following queries:

1. Describe deposit, branch.
2. Describe borrow, customers.
3. List all data from table DEPOSIT.
4. List all data from table BORROW.
5. List all data from table CUSTOMERS.
6. List all data from table BRANCH.
7. Give account no and amount of depositors.
8. Give name of depositors having amount greater than 4000.
9. Give name of customers who opened account after date '1-12-96'.

2. Create the below given table and insert the data accordingly.

Create the below given table and insert the data accordingly.

Create Table Job (job_id, job_title, min_sal, max_sal)
COLUMN NAME DATA TYPE job_id Varchar2(15) job_title Varchar2(30) min_sal Number(7,2) max_sal Number(7,2)

Create table Employee (emp_no, emp_name, emp_sal, emp_comm, dept_no)
COLUMN NAME DATA TYPE emp_no Number(3) emp_name Varchar2(30) emp_sal Number(8,2) emp_comm Number(6,1) dept_no Number(3)
Insert following values in the table job.
job_id job_name min_sal max_sal IT_PROG Programmer 4000 10000 MK_MGR Marketing manager 9000 15000 FI_MGR Finance manager 8200 12000 FI_ACC Account 4200 9000 LEC Lecturer 6000 17000 COMP_OP Computer Operator 1500 3000

Insert following values in the table Employee.

emp_n emp_name emp_sal emp_comm dept _no 101 Smith 800 20 102 Snehal 1600 300 25 103 Adama 1100 0 20 104 Aman 3000 15 105 Anita 5000 50,000 10 106 Sneha 2450 24,500 10 107 Anamika 2975 30 Perform following queries

1. Retrieve all data from employee, jobs and deposit.
2. Give details of account no. and deposited rupees of customers having account opened between dates 01-01-06 and 25-07-06.
3. Display all jobs with minimum salary is greater than 4000.
4. Display name and salary of employee whose department no is 20. Give alias name to name of employee.
5. Display employee no,name and department details of those employee whose department lies in(10,20)
6. To study various options of LIKE predicate
7. Display all employee whose name start with ‘A’ and third character is ‘ ‘a’.
8. Display name, number and salary of those employees whose name is 5 characters long and first three characters are ‘Ani’.
9. Display the non-null values of employees and also employee name second character should be ‘n’ and string should be 5 character long.
10. Display the null values of employee and also employee name’s third character should be ‘a’.
11. What will be output if you are giving LIKE predicate as ‘%_%’ ESCAPE ‘\’

3. To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables.

1. List total deposit from deposit.
2. List total loan from karolbagh branch
3. Give maximum loan from branch vrce.
4. Count total number of customers
5. Count total number of customer’s cities.
6. Create table supplier from employee with all the columns.

	7. Create table sup1 from employee with first two columns. 8. Create table sup2 from employee with no data 9. Insert the data into sup2 from employee whose second character should be 'n' and string should be 5 characters long in employee name field. 10. Delete all the rows from sup1. 11. Delete the detail of supplier whose sup_no is 103. 12. Rename the table sup2. 13. Destroy table sup1 with all the data. 14. Update the value dept_no to 10 where second character of emp. name is 'm'. 15. Update the value of employee name whose employee number is 103.
4.	**To study Single-row functions** 1. Write a query to display the current date. Label the column Date 2. For each employee, display the employee number, job, salary, and salary increased by 15% and expressed as a whole number. Label the column New Salary 3. Modify your query no 4.(2) to add a column that subtracts the old salary from the new salary. Label the column Increase 4. Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names 5. Write a query that produces the following for each employee: 6. earns monthly 7. Display the name, hire date, number of months employed and day of the week on which the employee has started. Order the results by the day of the week starting with Monday. 8. Display the hiredate of emp in a format that appears as Seventh of June 1994 12:00:00 AM. 9. Write a query to calculate the annual compensation of all employees (sal+comm.). **"Like" Queries:** 1. Display all customers whose name start with 'M'. 2. Display all the customers whose name ends with 'L'. 3. Display all loan details whose branch starts with 'A'. 4. Display the details of sailors whose name is minimum 6 characters long. 5. Display the details of Employees whose address starts with 'S'. 6. List the details of the boat ending with 'e'. 7. List the details of clients having 'h' as a 3rd character in his/her name. 8. List Client Name, due balance and city whose pin code starts with 4. 9. List all customers whose city contains 'a' as second character. List client names and city whose state has 'a' as fourth or fifth character.
5.	**Displaying data from Multiple Tables (join)** 1. Give details of customers ANIL. 2. Give name of customer who are borrowers and depositors and having living city nagpur 3. Give city as their city name of customers having same living branch. 4. Write a query to display the last name, department number, and department name for all employees. 5. Create a unique listing of all jobs that are in department 30. Include the location of the department in the output 6. Write a query to display the employee name, department number, and department name for all employees who work in NEW YORK. 7. Display the employee last name and employee number along with their manager's last name and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively. Create a query to display the name and hire date of any employee hired after employee SCOTT
6.	**To apply the concept of Aggregating Data using Group functions.** 1. List total deposit of customer having account date after 1-jan-96. 2. List total deposit of customers living in city Nagpur. 3. List maximum deposit of customers living in bombay. 4. Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number. 5. Write a query that displays the difference between the highest and lowest salaries. Label the column DIFFERENCE. 6. Create a query that will display the total number of employees and, of that total, the number of employees hired in

	1995, 1996, 1997, and 1998 7. Find the average salaries for each department without displaying the respective department numbers. 8. Write a query to display the total salary being paid to each job title, within each department. 9. Find the average salaries > 2000 for each department without displaying the respective department numbers. 10. Display the job and total salary for each job with a total salary amount exceeding 3000, in which excludes president and sorts the list by the total salary. List the branches having sum of deposit more than 5000 and located in city “bombay.”.
7.	**To solve queries using the concept of sub query.** 1. Write a query to display the last name and hire date of any employee in the same department as SCOTT. Exclude SCOTT 2. Give name of customers who are depositors having same branch city of mr. sunil. 3. Give deposit details and loan details of customer in same city where pramod is living. 4. Create a query to display the employee numbers and last names of all employees who earn more than the average salary. Sort the results in ascending order of salary. 5. Give names of depositors having same living city as mr. anil and having deposit amount greater than 2000 6. Display the last name and salary of every employee who reports to ford. 7. Display the department number, name, and job for every employee in the Accounting department. 8. List the name of branch having highest number of depositors. 9. Give the name of cities where in which the maximum numbers of branches are located. Give name of customers living in same city where maximum depositors are located.
8.	**Manipulating Data** 1. Give 10% interest to all depositors. 2. Give 10% interest to all depositors having branch vrce 3. Give 10% interest to all depositors living in nagpur and having branch city bombay. 4. Write a query which changes the department number of all employees with empno 7788’s job to employee 7844’current department number. 5. Transfer 10 Rs from account of anil to sunil if both are having same branch. 6. Give 100 Rs more to all depositors if they are maximum depositors in their respective branch. 7. Delete depositors of branches having number of customers between 1 to 3. 8. Delete deposit of vijay. Delete borrower of branches having average loan less than 1000.
9.	**TCL and DCL Commands in SQL**
10.	**PL/SQL Block:** Write a PL/SQL Block to Add 2 Numbers Write a PL/SQL Block to find Area of Rectangle, Triangle and Square. Write a PL/SQL Block to find Maximum of 3 numbers Write a PL/SQL Block to print sum of N Numbers using For Loop. Write a PL/SQL Block to generate Fibonacci series of N numbers

Course: BTech **Semester:** 3

Prerequisite: Basic set theory and elementary programming logic

Rationale : Discrete Mathematics forms the mathematical foundation of computer science, information technology, and modern computational systems. The subject develops logical reasoning, analytical thinking, and problem-solving skills essential for designing algorithms, data structures, networks, cryptographic systems, and software applications.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	-	-	-	3	20	20	-	60	-	100

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**Sets, Relations and Functions** Sets and Operations on Sets Finite and Infinite Sets Countable and Uncountable Sets Cantor's Diagonal Argument Power Set Theorem Cartesian Products Relations: Reflexive, Symmetric, Transitive Equivalence Relations and Partial Order Relations Functions: One–One, Onto and Bijective Schroeder–Bernstein Theorem (statement and intuition)	**20**	**9**
2	**Mathematical Induction, Recursion and Counting Techniques** Principle of Mathematical Induction Well Ordering Principle Recursive Definitions Recurrence Relations (linear recurrences, basic solutions) Division Algorithm Prime Numbers Euclidean Algorithm for GCD Fundamental Theorem of Arithmetic Counting Techniques: Inclusion–Exclusion Principle Pigeonhole Principle Permutations and Combinations	**20**	**9**
3	**Propositional Logic and Proof Techniques** Propositional Logic: Syntax and Semantics Truth Tables and Logical Connectives Validity and Satisfiability Logical Equivalence and Laws of Logic Rules of Inference Predicate Logic and Quantifiers Proof Techniques: Direct Proof Proof by Contradiction Proof by Contraposition Proof of Necessity and Sufficiency	**20**	**9**

	Logic in Program Reasoning: Preconditions and Postconditions Introduction to Loop Invariants		
4	**Algebraic Structures and Boolean Algebra** Algebraic Structures with One Binary Operation: Semigroups Monoids Groups (basic properties) Subgroups and Normal Subgroups Cyclic and Permutation Groups (introductory) Congruence Relations Lattices: Definition, Properties, Hasse Diagrams Boolean Algebra and Boolean Rings Identities and Principle of Duality Boolean Functions Disjunctive Normal Form (DNF) Conjunctive Normal Form (CNF)	**18**	**8**
5	**Graph Theory and Trees** Graphs: Definitions and Properties Degree, Paths, Cycles, Connectivity Subgraphs and Graph Isomorphism Eulerian and Hamiltonian Graphs Graph Coloring: Vertex Coloring Edge Coloring Map Coloring Planar Graphs and Perfect Graphs Trees and Rooted Trees Weighted Trees Prefix Codes (Huffman Coding) Graph Algorithms: Breadth First Search (BFS) Depth First Search (DFS) Shortest Path Concepts	**22**	**10**
	Total	**100**	**45**

Reference Books

1.	**Discrete Mathematics and its Applications (TextBook)** By Kenneth H. Rosen | Tata McGraw – Hill
2.	**Discrete Mathematical Structure and It's Application to Computer Science (TextBook)** By J.P. Tremblay and R. Manohar | TataMcgraw-Hill | TMG
3.	**Graph Theory with Applications to Engineering and Computer Science (TextBook)** By Narsingh Deo | PHI
4.	**Elements of Discrete Mathematics A Computer Oriented Approach** By C. L. Liu and D P Mohapatra | Tata McGraw – Hill | 3
5.	**Discrete Mathematics with Applications** By Susanna S. Epp | Wadsworth Publishing Co. Inc. | 4

Course Outcome

After Learning the Course the students shall be able to:
1: Apply set theory, relations and functions to model computational problems. 2: Use induction, recursion and counting techniques to analyze algorithms. 3: Construct valid logical arguments and mathematical proofs. 4: Identify and apply algebraic and Boolean structures in computing systems. 5: Analyze graphs and trees to solve problems related to connectivity and optimization.

Course: BTech **Semester:** 3

Prerequisite: Knowledge of Advanced Communication and Interpersonal Skills

Rationale : This course develops workplace-oriented communication skills by bridging academic language competence with professional communication requirements.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
1	-	2	-	2	40	-	20	60	30	150

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**Sentence Correction** Error identification (grammar, usage, style) Common workplace errors Contextual grammar usage	10	2
2	**Para Jumbles & Sentence Reordering** Logical sequencing Cohesion markers Theme identification	8	1
3	**Statement and Assumptions** Fact vs assumption Logical reasoning basics Workplace problem scenarios	10	1
4	**Reading Comprehension (Level of Difficulty - Advanced)** Inferential questions Author's tone & intent Vocabulary in context	12	2
5	**Resume and Cover Letter Writing** Resume formats Achievement-based bullet points Customizing cover letters	14	2
6	**Building a Professional LinkedIn Profile** Professional headline Summary writing Digital networking ethics	8	1
7	**Just a Minute (JAM)** Idea organization Fluency techniques Time management in speech	8	1
8	**Telephone and Video Call Etiquette** Opening & closing calls Voice modulation Virtual meeting etiquette	8	1
9	**Email Writing** Format Professional tone Subject lines	10	2

	Email etiquette		
10	**Report Writing Report Writing** Types of reports Structure & formatting Use of visuals & data	**12**	**2**
	Total	**100**	**15**

Reference Books

1.	**Business Communication Today** By Bovee, Courtland L., and John V. Thill | Pearson Education, Pub. Year 2019
2.	**Essentials of Business Communication** By Guffey, Mary Ellen, and Dana Loewy. | Cengage Learning, Pub. Year 2018
3.	**Advanced Grammar in Use** By Hewings, Martin. | Cambridge University Press, Pub. Year 2013
4.	**English Vocabulary in Use: Advanced.** By McCarthy, Michael, and Felicity O'Dell | Cambridge University Press, Pub. Year 2017
5.	**Personality Development and Soft Skills.** By Mitra, Barun K | Oxford University Press, Pub. Year 2011
6.	**Technical Communication: Principles and Practice** By Raman, Meenakshi, and Sangeeta Sharma | Oxford University Press, Pub. Year 2018

Course Outcome

After Learning the Course the students shall be able to:

CLO 1 Identify grammatical, usage, and style errors; logically reorder sentences; and differentiate facts from assumptions in workplace problem scenarios.
CLO 2 Understand the usage of grammatical rules, cohesion markers, professional writing formats, and communication etiquette to produce accurate workplace communication.
CLO 3 Apply principles of professional communication to ensure clarity, coherence,
time management, and etiquette in both written and spoken workplace contexts.
CLO 4 Analyse effective verbal, digital, and virtual communication skills through JAM participation, LinkedIn profile optimization, and telephone/video call interactions.
CLO 5 Create ATS-friendly resumes, customized cover letters, professional emails,
structured reports, optimized LinkedIn profiles.

List of Practical	
1.	Sentence Correction ● Grammar & usage error identification ● Context-based sentence correction worksheets ● Common workplace error correction ● Peer editing activities
2.	Para Jumbles and Reordering of Sentence ● Identifying topic sentences ● Logical sequencing exercises ● Use of cohesion markers ● Timed para-jumble practice
3.	Reading Comprehension (Level of Difficulty - Advanced) Inferential and analytical questions ● Identifying author's tone & intent ● Vocabulary-in-context activities ● Group discussion on passages
4.	Resume and Cover Letter Writing ● Resume formats (chronological, functional) ● Achievement-based bullet writing ● ATS-friendly resume drafting ● Customized cover letter writing
5.	Statement and Assumptions ● Identification of implicit assumptions through guided exercises ● Application of assumption-testing techniques (possibility test) ● Analysis of case-based and real-life reasoning scenarios ● Timed practice drills with discussion of common errors
6.	Building a Professional LinkedIn Profile ● Writing professional headlines ● Summary and About section drafting ● Profile optimization task ● Digital networking ethics
7.	Just a Minute (JAM) ● Topic-based JAM speaking practice ● Fluency and coherence drills ● Time-management techniques ● Individual feedback sessions
8.	Telephone and Video Call Etiquette ● Professional call role-plays ● Voice modulation exercises ● Mock video meeting practice ● Virtual etiquette evaluation
9.	Report Writing ● Types of reports (incident, progress, proposal) ● Structure and formatting practice ● Use of visuals and data ● Writing and reviewing short reports
10.	Email Writing ● Professional email drafting ● Subject-line writing activities ● Tone and etiquette correction ● Peer review and rewriting

Course: LL.B. **Semester:** 3

Prerequisite: Basic understanding of what law is, its sources (statutes, case law, customs), and the legal system's structure. Familiarity with the distinction between Public Law (e.g., Constitutional and Administrative Law) and Private Law (e.g., Contract Law, Tort Law). Knowledge of the historical evolution of constitutions, particularly the Constitution in question (e.g., Indian Constitution for India, U.S. Constitution for the United States). Awareness of the colonial, political, and socio-economic circum

Rationale : The rationale for Constitutional Law lies in its foundational role in structuring and guiding the governance of a nation while protecting the rights and freedoms of its citizens. Below are the key rationales for the existence and study of Constitutional Law: Constitutional Law provides the legal framework for the formation, powers, functions, and structure of government institutions (Legislature, Executive, and Judiciary). Ensures a clear distribution of power among the organs of government, preventing abuse and promoting accountability.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
					Internal Marks			External Marks		
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	T	CE	P	T	P	
1	-	-	-	0	-	50	-	-	-	50

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**UNIT – I** **History of Indian Constitution** **Nature of the Indian Constitution** **Salient Features of the Indian Constitution** **The preamble of the Indian Constitution**		
2	**UNIT – IIA] Citizen ship [From Article 1 to 11] B] State B] Article 13 C] Article 14**		
3	**Unit – IIIFundamental rights from article 15 to 20**		
4	**Unit- IVFundamental right from article 21 to 32 of the Indian Constitution and Fundamental duties.**		
	Total		

Reference Books

1.	**History of Democratic Constitution: The Indian Expenditure** By Austin G | Oxford, Pub. Year 2000

Course: BTech **Semester:** 4

Prerequisite: knowledge of Computer and Information system

Rationale : This course is design to provide the basic knowledge about the data & signals. It also provides basic concepts of computer network and firm foundation for understanding how data communication occurs in the Transmission Medium. It will help to develop logical abilities and practically setup the network .

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	-	-	-	3	20	20	-	60	-	100

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**DATA COMMUNICATION COMPONENTS:**Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum	25	11
2	**DATA LINK LAYER AND MEDIUM ACCESS SUB LAYER:**Error Detection and Error Correction -Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back 'N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols - Pure ALOHA, Slotted ALOHA,CSMA/CD,CDMA/CA	25	11
3	**Network Layer:**Switching, Logical addressing 'IPV4, IPV6; Address mapping 'ARP, RARP, BOOTP and DHCP' Delivery, Forwarding and Unicast Routing protocols, IP Routing – Intra Domain Routing Protocols, Inter Domain Routing Protocols (BGP)	20	10
4	**Application Layer:**Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography	15	6
5	**Transport Layer:**Process to Process Communication, User Datagram Protocol(UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm	15	7
	Total	100	45

Reference Books

1.	**Computer Networks (TextBook)** By Andrew Tanenbaum | Pearson Education | 5th Edition
2.	**Internetworking with TCP/IP Principles, Protocols and Architecture** By Douglas E Comer
3.	**TCP/IP Illustrated (TextBook)** By Richard Stevens
4.	**Data Communication and Networking** By Behrouz A. Forouzan
5.	**"Data and computer communications",** By William Stallings | Prentice Hall

Course Outcome

After Learning the Course the students shall be able to:

1. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
2. Explain the functions of the different layers of the OSI Protocol
3. Describe and Design for a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component
4. Learn on the given problem-related TCP/IP protocol developed for the network programming.
5. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, and Firewalls using open-source available software and tools.

Course: BTech

Semester: 4

Prerequisite:

Rationale : -

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
-	-	2	-	1	-	-	20	30	-	50

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course: BTech

Semester: 4

Prerequisite:

Rationale : -

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	-	-	-	3	-	20	-	60	-	100

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course: BTech

Semester: 4

Prerequisite:

Rationale : -

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
-	-	2	-	1	-	-	20	-	30	50

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course: BTech **Semester:** 3

Prerequisite: Basic understanding of computer system

Rationale : This course provides a detailed understanding of the functional components of a computer system, their characteristics, performance, and interactions, including the system bus, various types of memory, input/output organization, and the CPU. The course also covers key architectural issues such as instruction set design, programming models, and data types. In addition, students are introduced to the increasingly important area of parallel organization. This course serves as a foundation for developing hardware-related projects and is therefore an essential course for students of the Computer Engineering program.

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
					Internal Marks			External Marks		
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	T	CE	P	T	P	
2	-	-	-	2	-	-	-	60	-	100

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Course Content

W - Weightage (%) , **T** - Teaching hours

Sr.	Topics	W	T
1	**Introduction to Microprocessor 8085**Introduction to microprocessors, 8085 Microprocessor, Instruction set and computer languages, 8085 Programming Model, Instruction, data formats, and data storage	15	4
2	**Microprocessor Architecture and Interfacing**Architecture of 8085 microprocessor, Microprocessor operation, Memory devices and I/O devices, Memory interfacing techniques, Interfacing of I/O devices	20	6
3	**Programming Methods Using Instructions**8085 instruction set, Looping techniques, Counting and indexing, Logical operations,Rotate and compare instructions	20	6
4	**Computer Organization – Register Transfer and Basic Computer DesignRegister Transfer** Register Transfer Language (RTL) , Bus design using multiplexers ,Bus design using tri-state buffers, Memory transfers, Arithmetic micro-operations, Logic micro-operations, Shift micro-operations, Arithmetic logic shift unit **Basic Computer Design** Instruction codes, Computer registers, Computer instructions, Timing and control, Instruction cycle, Memory reference instructions, Register reference instructions, I/O reference instructions, Interrupts, Design of accumulator unit	25	8
5	**Computer Organization – Assembler and Memory OrganizationAssembler** Machine language and assembly language, Assembler concepts, Program loops, Programming arithmetic operations, Programming logic operations, Subroutines, I/O programming. **Memory Organization** Memory hierarchy, Main memory, Auxiliary memory, Flash memory, Associative memory, Cache memory, Virtual memory	20	6
	Total	100	30

Reference Books

1.	**Microprocessor Architecture, Programming and Applications with 8085** By Gaonkar, Ramesh S.
2.	**8085 Microprocessor And its Applications** By A. NagoorKani | TMH Education Pvt. Ltd
3.	**Microprocessor 8085 and its Interfacing** By Sunil Mathur | PHI Learning Pvt. Ltd
4.	**Microprocessor and Interfacing** By Douglas V Hall | Mcgraw Hill Higher Education | -
5.	**Computer System Architecture** By M.Morris Mano | PHI | 3rd Edition

Course Outcome

After Learning the Course the students shall be able to:
1. Explain the architecture, programming model, instruction set, and data formats of the 8085 microprocessor.
2. Analyze the operations of the 8085 microprocessor and design suitable memory and I/O interfacing circuits.
3. Develop and execute assembly language programs using the 8085 instruction set to solve basic computational problems.
4. Apply advanced programming techniques to construct efficient assembly language routines for the 8085 microprocessor.
5. Explain and evaluate the interrupt structure, types, and handling mechanisms of the 8085 microprocessor.

Course: BTech **Semester:** 3

Prerequisite: Basic understanding of computer system

Rationale : This course provides a detailed understanding of the functional components of a computer system, their characteristics, performance, and interactions, including the system bus, different types of memory, input/output organization, and the CPU. The course also covers architectural issues such as instruction set architecture, programming concepts, and data types. In addition, students are introduced to the increasingly important area of parallel organization. This course serves as a foundation for developing hardware-related projects and is therefore an important course for all students of the computer engineering

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
-	-	2	-	1	-	-	-	-	30	50

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Reference Books

1.	**Microprocessor Architecture, Programming and Applications with 8085** By Gaonkar, Ramesh S.
2.	**8085 Microprocessor And its Applications** By A. NagoorKani | TMH Education Pvt. Ltd
3.	**Microprocessors Interfacing** By Douglas Hall,
4.	**Microprocessor 8085 and its Interfacing** By Sunil Mathur | PHI Learning Pvt. Ltd
5.	**Microprocessor & Interfacing Programming and hardware Revised second edition** By Hall, Douglas | Tata Mc Graw Hill 2006

Course Outcome

After Learning the Course the students shall be able to:

1. Explain the architecture, programming model, instruction set, and data formats of the 8085 microprocessor.
2. Analyze the operations of the 8085 microprocessor and design memory and I/O interfacing circuits.
3. Develop and execute assembly language programs using the 8085 instruction set to solve basic computational problems.
4. Apply advanced programming techniques to write efficient assembly language routines on the 8085 microprocessor.
5. Explain and evaluate the interrupt structure, types, and handling mechanisms of the 8085 microprocessor.

List of Practical	
1.	Part A: Addition of two 8-bit numbers using 8085 Part B: Addition of two 16-bit numbers using 8085 Part C: Subtraction of two 8-bit numbers using 8085
2.	Part A: Write an 8085 assembly language program to perform multiplication of two 8-bit numbers Part B: Write an 8085assembly language program to perform division of two 8-bit numbers
3.	Write a program to add a block of 8-bit data stored in memory locations
4.	Part A: Write an 8085 assembly language program to find the minimum from two 8-bit numbers Part B: Write an 8085 assembly language program to get the minimum from a block of n 8-bit numbers
5.	Part A: Write an 8085 assembly language program to find the maximum from two 8-bit numbers Part B: Write an 8085 assembly language program to get the maximum from a block of n 8-bit numbers
6.	Part A: Write an assembly language program to sort data in ascending order Part B: Write an assembly language program to sort data in descending order
7.	Part A: Write an 8085 assembly language program to convert a given BCD number into its equivalent binary number Part B: Write an 8085 assembly language program to convert a given binary number into its equivalent BCD number
8.	Part A: Write an 8085 assembly language program to convert a given binary number into its equivalent ASCII number Part B: Write an 8085 assembly language program to convert a given ASCII number into its equivalent binary number
9.	Write an 8085 assembly language program to calculate the sum of a series of even numbers
10.	Write an 8085 assembly language program to calculate the sum of a series of odd numbers