Second Year (Lateral Entry) Curriculum

Admission Year 2026-27

Bachelor of Technology (Lateral Entry) CSE (Cyber Security)

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

Semester 3

a. **Course Name:** Database Management System
b. **Course Code:** 03010504PC05
c. **Prerequisite:** Basic Computer Knowledge
d. **Rationale:** The course will enable students to understand the various issues involved in the design and implementation of a database system, as well as execute various database queries using SQL.

e. Course Learning Objective:

CLOBJ1	Design and create relational database schemas using DDL commands and managedatausing DML, TCL, and DCL statements.
CLOBJ2	Retrieve and manipulate data from single and multiple tables using SQLqueries, joins, subqueries, and conditional operators.
CLOBJ3	Retrieve and manipulate data from single and multiple tables using SQLqueries, joins, subqueries, and conditional operators
CLOBJ4	Apply aggregate and group functions to analyze data and generate meaningful summariesusing GROUP BY and HAVING clauses
CLOBJ5	Perform advanced data manipulation operations including updates, deletions, sorting, filtering, and pattern matching using single-row and multi-row functions
CLOBJ6	Develop and execute PL/SQL blocks to implement procedural logic, control structures, andbasic programming constructs within a database environment.

f. Course Learning Outcomes:

CLO1	Analyze and design database management systems using the ER model.
CLO2	Implement database queries using SQL concepts
CLO3	Design well-structured databases using normalization techniques.
CLO4	Evaluate query performance parameters and understand database security mechanisms.
CLO5	Apply large-scale database technologies for efficient data processing.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
3	**0**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

L-Lectures;**T**-Tutorial;**P-**Practical;**C**-Credit;**MSE-**Mid-SemesterEvaluation,**CE**-Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Topics**	**Weightage**	**Teaching Hours**
1	Introduction and applications of DBMS, file processing systems and their limitations, ANSI/SPARC architecture, data independence, client–server architecture, database users and DBA, database architecture. **Data Models:** ER Model – entities, attributes and attribute types, relationships, mapping cardinalities, participation constraints, weak entity sets, specialization, generalization, aggregation, ER diagrams, design issues, extended ER features.	15%	6
2	**SQL Commands:** • Data Definition Language (DDL)		

	• Data Manipulation Language (DML) • Data Control Language (DCL) • Transaction Control Language (TCL) **Predicates and Clauses:** Logical operators (AND, OR), relational operators, BETWEEN, IN and NOT IN, LIKE predicates. **SQL Functions:** Aggregate, character, arithmetic, date, and conversion functions. **PL/SQL Concepts:** Views, PL/SQL blocks, cursors, triggers, stored procedures, and stored functions.	15%	6
3	**Relational data model:** introduction, degree, cardinality. **Constraints and Keys:** Primary key, foreign key, super key, candidate key, NOT NULL, CHECK constraint. **Relational Algebra:** Selection, projection, cross product, rename, joins (natural and outer), set operations (union, intersection, set difference), aggregate functions. **Functional Dependencies:** Basic concepts, attributes and domains, Codd's rules. **Relational Integrity:** Domain integrity, referential integrity, enterprise constraints. **Database Design:** Features of good relational design, normalization, atomic domains, 1NF, decomposition using functional dependencies, algorithms for decomposition, 2NF, 3NF, BCNF, 4NF, and 5NF.	20%	10
4	Transaction concepts, ACID properties, transaction life cycle, scheduling, serial and interleaved schedules, transaction operations, serializability (view and conflict), two-phase commit protocol. Database Recovery: Log-based recovery, shadow paging, checkpoints. Concurrency Control: Lock-based protocols, two-phase locking, intention locking, multiple granularity, timestamp-based protocols. Deadlocks: Detection, recovery, prevention (wait-die, wound-wait, timeout-based approaches).	20%	10
5	Query Processing: Introduction, layers of query processing, measures of query cost. Security: Data security, data integrity, authentication, authorization, encryption and decryption, access control models (DAC, RBAC, MAC), intrusion detection, SQL injection attacks.	20%	10
6	Introduction to NoSQL databases, internet databases, cloud databases, mobile databases, SQLite, XML databases, MongoDB. Big Data and XML: DTD, XML schema, XQuery, XPath.	20%	5

i. Text Book and Reference Book:

1. Database System Concepts Abraham Silberschatz, Henry F. Korth, and S. Sudarshan McGraw-Hill International, 6th Edition
2. An Introduction to Database Systems C. J. Date, A. Kannan, and S. Swamynathan Pearson Education, 8th Edition
3. SQL, PL/SQL – The Programming Language Ivan Bayross BPB Publications
4. The Definitive Guide to MongoDB David Hows, Peter Membrey, Eelco Plugge, and Tim Hawkins Apress, Second Edition
5. Storing and Managing Big Data – NoSQL, Hadoop and More Kevin Roebuck Emereo Pty Limited ISBN: 1743045743 / 9781743045749
6. Using SQLite Joy A. Kreibich O'Reilly Media ISBN: 978-93-5110-934-1

Sr. NO.	Experiment List
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

(2)

a. **Course Name:** Data Structures and Algorithms
b. **Course Code:** 03010503PC01
c. **Prerequisite Computer Programming and Basic Syntaxes**
d. **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.**

e. Course Learning Objective:

CLOBJ1	Implement linear data structures such as Stack, Queue, Single Linked List, and Doubly Linked List along with their fundamental operations.
CLOBJ2	Apply stack data structure to solve computational problems such as Infix to Postfix conversion, Postfix expression evaluation, and Towers of Hanoi.
CLOBJ3	Analyze and implement searching techniques including Binary Search and Interpolation Search for efficient data retrieval.
CLOBJ4	Implement and compare various sorting algorithms such as Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, and Merge Sort based on performance and efficiency.
CLOBJ5	Design and implement Binary Search Tree (BST) and perform tree traversals (Preorder, Inorder, Postorder) along with insertion and deletion operations.

f. Course Learning Outcomes:

CLO1	Implement linear data structures such as Stack, Queue, Single Linked List, and Doubly Linked List along with their fundamental operations.
CLO2	Apply stack data structure to solve computational problems such as Infix to Postfix conversion, Postfix expression evaluation, and Towers of Hanoi.
CLO3	Analyze and implement searching techniques including Binary Search and Interpolation Search for efficient data retrieval.
CLO4	Implement and compare various sorting algorithms such as Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, and Merge Sort based on performance and efficiency.
CLO5	Design and implement Binary Search Tree (BST) and perform tree traversals (Preorder,

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		Total
L	T	P	C	MSE	CE	P	Theory	P	
3	0	4	3	20	20	20	60	-	150

L-Lectures; **T**-Tutorial;**P**-Practical;**C**-Credit;**MSE**-Mid-SemesterEvaluation,**CE**-Continuous Evaluation, **ESE**- End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
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	10%	06

	Memory, dynamically allocated arrays. Performance analysis of an algorithm and space and time complexities		
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 problems	**15%**	**08**
3	**Linked Lists:** Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. Applications of Linked lists	**10%**	**05**
4	**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%**	**06**
4	**Searching and Sorting:** Interpolation Search Sorts: Selection Sort Insertion Sort Bubble Sort Quick Sort Merge Sort, Radix Sort	**10**	**05**
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; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression	**10%**	**04**
6	**Red Black Trees and AVL Trees:** Introduction-Operations on Red Black Trees AVL tree Construction Operations on AVL Trees	**15%**	**08**
7	**Hashing:** Hash Table organizations, Hashing Functions, Static and Dynamic Hashing	**15%**	**03**

i. Text Book and Reference Book:

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

Experiment List

Sr. NO.	Experiment List
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 binary search and interpolation search.
9	Implement Bubble sort, selection sort, Insertion sort, quick sort, merge sort.
10	Implement Binary search Tree and its operations (creation, insertion, deletion).
11	Implement Traversals Preorder Inorder Postorder on BST.
12	Implement Graphs and represent using adjaceny list and adjacency matrix and implement basic operations with traversals (BFS and DFS).

(3)

a. **Course Name:** Networking Concepts and Security
b. **CourseCode:** 03012603PC01
c. **Prerequisite:** Fundamentals of networking.
d. **Rationale:** The objective of this subject is to train the students about various types of pen testing methodology for network, basic concepts of penetration testing of wired and wireless networks.

e. Course Learning Objective:

CLOBJ1	Apply Cisco Packet Tracer to design and configure logical network topologies and establish communication within and between networks.
CLOBJ2	Configure routing, VPN, and proxy services in Windows environment to enable secure communication across networks.
CLOBJ3	Apply network monitoring and reconnaissance techniques using tools such as Wireshark, Nmap, Advanced IP Scanner, and perform wireless reconnaissance.
CLOBJ4	Analyze and perform network security attacks including ARP spoofing, DNS spoofing (MITM), NTLM brute force attacks, and assess their impact on network security.
CLOBJ5	Evaluate network vulnerabilities using tools like Nessus and generate security assessment

f. Course Learning Outcomes:

CLO1	Learn networking concepts and enhance their knowledge of different network devices.
CLO2	Learn and apply different types of network and wireless attacks and their countermeasures.
CLO3	Executing vulnerability assessment and penetration testing on IT Landscape of organization.
CLO4	Prepare VAPT reports.
CLO5	Enhance their skills on Patch Management of IT Organization.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

L-Lectures;**T**-Tutorial;**P-**Practical;**C**-Credit;**MSE-**Mid-SemesterEvaluation,**CE**-Continuous Evaluation, **ESE-**End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Types of Network & OSI Layers:** Types of networks, IP Address, NAT, IP Subnets, DHCP Server, Ports, DNS, Proxy Servers, DNS Server, OSI and TCP IP Model	20%	9
2	**Basics of Routing & Switching:** Routers, Switches, Endpoint solutions, Access Directory, TOR Network. Networking Devices (Layer1,2,3) – Different types of network layer attacks–Firewall, ACL, Packet Filtering, DMZ, Alerts and Audit Trails	15%	7
3	**Proxy & VPNs:** PN and its types –Tunnelling Protocols – Tunnel and Transport Mode –Authentication Header- IPSEC Protocol Suite – IKE PHASE 1, Implementation of VPNs.	20%	10
4	**Wireless Attacks:** Network Sniffing, Wireshark, packet analysis, display and capture filters, ettercap, DNS Poisoning, Denial of services, Vulnerability scanning, Nessus, Network Policies, Network Scanning Report Generation, Router attacks, Packet Sniffing, Types of authentication, Fake Authentication Attack, De authentication, Attacks on WPA and WPA-2 Encryption, fake hotspot, WPA & WPA-2 attacks, Wireless Hacking using phishing, MITM (man in the middle attack), Brute Force Attacks	25%	11
5	**Network pentest:** HOST DISCOVERY, PORT SCANNING. , Banner Grabbing/OS Fingerprinting., Scan for Vulnerabilities., Draw Network Diagrams., Prepare Proxies., Document all Findings	20%	10

*Continuous Evaluation:

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Text Book and Reference Book:

1. Network Security, Private communication in public world (2nd Ed.) PHI - Kaufman, C., Perlman, R., & Speciner, M. (TextBook)
2. Network Security. Wiley - Perez, Andre.
3. Cryptography and Network Security: Principles and Practice (5th Ed.). Prentice Hall - Stallings, W.
4. Network Attacks and Exploitation: A Framework. Wiley - Monte, M.
5. Network Security Essentials William Stallings.
6. Computer Networking: A Top-Down Approach James F. Kurose, Keith W. Ross

j. Experiment List:

Sr. NO.	Experiment List
1	Introduction of cisco packet tracer.
2	Create a logical network diagram with eight PCs and switch in cisco packet tracer which are in same network and check for the communication.
3	i. Create a logical network diagram with two different networks, each network contains two pc, one switch and one router. ii. Configure the routing on that scenario. Check the connectivity between different network devices.
4	Perform Man in Middle Attack for DNS spoofing and ARP using Ettercap tool.
5	Setup a VPN in windows operating system.
6	Setup a Proxy in windows operating system.
7	Perform the Wireless recon.
8	Perform the network vulnerability scanning using Nessus tool
9	Perform the NTLM based Brute Force Attack.
10	Perform the network sniffing using Wireshark.
11	Perform the basic network scanning using Nmap tool.
12	Finding the live host in network using advance IP scanning tool.

(4)

a. **Course Name:** Java Programming

b. Course Code: 03010503PC03

c. Prerequisite: Basic knowledge of Problem Solving, Familiar in C

d. 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

e. Course Learning Objective:

CLOBJ1	Apply object-oriented programming principles and the Java development environment (JDK, JVM, JRE) to design, implement, compile, and execute Java programs.
CLOBJ2	Apply Java language basics such as data types, operators, control flow, and looping constructs to solve programming problems.
CLOBJ3	Design and implement Java programs
CLOBJ4	Use arrays, strings, and the Java Collections Framework to manage and process data efficiently.
CLOBJ5	Implement exception handling mechanisms to develop robust and error-resilient Java applications.
CLOBJ6	Develop Java applications using advanced features such as multithreading, file handling,

f. Course Learning Outcomes:

CLO1	Explore fundamental programming paradigms, object-oriented concepts, and the Java programming environment.
CLO2	Apply Java language basics such as data types, operators, control flow statements, and looping constructs to solve simple programming problems.
CLO3	Design
CLO4	Analyze and handle runtime errors using Java exception handling mechanisms to develop robust and reliable applications.
CLO5	Implement data handling solutions using arrays, strings, and Java Collections Framework for efficient data storage and manipulation.
CLO6	Develop Java applications using advanced features such as multithreading, file handling,

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		Total
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L-Lectures; **T**-Tutorial; **P-**Practical;**C**-Credit; **MSE-**Mid-SemesterEvaluation,**CE**-Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr.No.	Content	Weightage	Teaching Hours
1	Overview of OOP and Java: Programming Paradigms, Procedural vs Object-Oriented Programming, OOP Features, History of Java, Java Buzzwords, Java Platform Independence, JVM Architecture, JRE, JDK, Java Program Structure, Compilation and Execution Process, Java Environment Setup, JDK Installation, PATH and CLASSPATH, Introduction to IDEs	10	05
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, Enhanced for Loop, break Statement, continue Statement	20	09
3	**Object-Oriented Programming (OOP):** Classes and Objects, Constructors, Access Specifiers, Encapsulation, Inheritance, Types of Inheritance, super Keyword, Method Overriding, Polymorphism, Method Overloading, Runtime Polymorphism, Abstraction, Abstract Classes, Interfaces, Functional Interfaces, this Keyword, final Keyword, Object Class and its Methods	30	12
4	**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	10	05
5	**Data Structures and Strings:** Arrays, One-Dimensional Arrays, Multi-Dimensional Arrays, Array Operations, String Class, StringBuffer, StringBuilder, String Comparison, String Manipulation Methods, Introduction to Collections Framework, List Interface, ArrayList, LinkedList, Set Interface, HashSet, TreeSet, Map Interface, HashMap, TreeMap, Iterators, Generics	20	09
6	**Advanced Foundations and Java Frameworks:** Multithreading Concepts, Thread Creation, Thread Life Cycle, Synchronization, Inter-thread Communication, File Handling, File Class, Byte Streams, Character Streams, Buffered Streams, Serialization, Deserialization, Introduction to Java Frameworks, Spring Framework Overview, Spring Boot Basics, Hibernate and ORM Concepts, Lambda Expressions, Stream API, Optional Class, Date and Time API, Java Applications, Mini Project	10	05

i. Text Book and Reference Book:

1. Java: The Complete Reference — Herbert Schildt Publisher: McGraw-Hill Education (Latest 13th Edition)
2. Object Oriented Programming Through Java — P. Radha Krishna Publisher: Universities Press (India) Pvt. Ltd.
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).

j. Experiment List:

Sr. NO.	Experiment List
1	Write a Java program to display “Hello World” and demonstrate the Java program structure.
2	Write a Java program to demonstrate use of variables, data types, and type casting.
3	Write a Java program to perform arithmetic, relational, and logical operations.
4	Write a Java program using if–else and switch statements.
5	Write a Java program to demonstrate looping constructs (for, while, do-while).
6	Write a Java program to demonstrate break and continue statements.
7	Write a Java program to create a class and object and demonstrate constructors.
8	Write a Java program to demonstrate encapsulation using access specifiers.
9	Write a Java program to demonstrate inheritance and method overriding.
10	Write a Java program to demonstrate polymorphism (method overloading and overriding).
11	Write a Java program to implement abstraction using abstract classes and interfaces.
12	Write a Java program to demonstrate use of the this and super keywords.
13	Write a Java program to perform operations on one-dimensional and multi-dimensional arrays.
14	Write a Java program to demonstrate string handling using String, StringBuffer, and StringBuilder.
15	Write a Java program to implement List interface using ArrayList and LinkedList.
16	Write a Java program to implement Set interface using HashSet and TreeSet.
17	Write a Java program to demonstrate exception handling using try-catch-finally blocks.
18	Write a Java program to create and use custom exceptions.
19	Write a Java program to demonstrate multithreading using Thread class and Runnable interface.

(5)

a. **Course Name:** Discrete Mathematics
b. **Course Code:** 03019103BS01
c. **Prerequisite: Basic set theory and elementary programming logic**
d. **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.

e. Course Learning Objective:

CLOBJ1	Apply set theory, relations and functions to model computational problems.
CLOBJ2	Use induction, recursion and counting techniques to analyze algorithms.
CLOBJ3	Construct valid logical arguments and mathematical proofs.
CLOBJ4	Identify and apply algebraic and Boolean structures in computing systems.
CLOBJ5	Analyze graphs and trees to solve problems related to connectivity and optimization.
CLOBJ6	Apply set theory, relations and functions to model computational problems.

f. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		Total
L	T	P	C	MSE	CE	P	Theory	P	
3	-	-	3	20	20	-	60	-	100

L-Lectures;**T**-Tutorial;**P**-Practical;**C**-Credit;**MSE-**Mid-SemesterEvaluation,**CE**-Continuous Evaluation, **ESE-**End Semester Examination

g. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Sets, Relations and Functions** **Sets and Operations on Sets** **Finite and Infinite Sets** **Countable and Uncountable Sets** **Cantor's Diagonal Argument**	20	9
	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)**		

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**	**09**
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** Logic in Program Reasoning: Preconditions and Postconditions Introduction to Loop Invariants	**20**	**09**
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**	**08**
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**

h. Text Book and Reference Book:

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

(6)

a. **Course Name:** Functional Communication Skills

b. **Course Code:** 03010003HM01

c. **Prerequisite:** Knowledge of Advanced Communication and Interpersonal Skills

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

e. Course Learning Objective:

CLOBJ 1	Identify grammatical, usage, and style errors; logically reorder sentences; and differentiate facts from assumptions in workplace problem scenarios.
CLOBJ2	Understand the usage of grammatical rules, cohesion markers, professional writing formats, and communication etiquette to produce accurate workplace communication. Apply principles of professional communication to ensure clarity, coherence, time management, and etiquette in both written and spoken workplace contexts.
CLOBJ 3	Analyse effective verbal, digital, and virtual communication skills through JAM participation, LinkedIn profile optimization, and telephone/video call interactions.
CLOBJ 4	Create ATS-friendly resumes, customized cover letters, professional emails, structured reports, optimized LinkedIn profiles
CLOBJ 5	Identify grammatical, usage, and style errors; logically reorder sentences; and differentiate facts from assumptions in workplace problem scenarios.

f. Course Learning Outcomes:

CLO1	Identify grammatical, usage, and style errors; logically reorder sentences; and differentiate facts from assumptions in workplace problem scenarios.
CLO2	Understand the usage of grammatical rules, cohesion markers, professional writing formats, and communication etiquette to produce accurate workplace communication. Apply principles of professional communication to ensure clarity, coherence, time management, and etiquette in both written and spoken workplace contexts.
CLO3	Analyse effective verbal, digital, and virtual communication skills through JAM participation, LinkedIn profile optimization, and telephone/video call interactions.
CLO4	Create ATS-friendly resumes, customized cover letters, professional emails, structured reports, optimized LinkedIn profiles.
CLO5	Identify grammatical, usage, and style errors; logically reorder sentences; and differentiate facts from assumptions in workplace problem scenarios.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
1	**0**	**2**	**2**	40	-	20	60	30	**150**

L-Lectures;**T**-Tutorial;**P-**Practical;**C**-Credit;**MSE-**Mid-SemesterEvaluation,**CE**-Continuous Evaluation, **ESE-**EndSemester Examination

h. Course Content:

Lab (Practical)

Sr. No.	Content	Weightage	Teaching Hours
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, Email etiquette	10	2
10	Report Writing Report Writing Types of reports Structure & formatting Use of visuals & data	12	2

i. Text Book and Reference Book:

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

Semester 4

(1)

a. **Course Name:** Design and Analysis of Algorithm
b. **Course Code:**
c. **Prerequisite:** Data Structures, Fundamentals of Programming
d. **Rationale:** This course covers the study of data structures and algorithms, including the analysis of time and space complexity, and the development of efficient algorithms using mathematical techniques and programming. It also enables students to design new algorithms through mathematical analysis and practical implementation.

e. Course Learning Objective:

CLOBJ1	Implement divide-and-conquer algorithms such as Binary Search, Quick Sort, Merge Sort, and Strassen's Matrix Multiplication.
CLOBJ2	Design and implement minimum spanning tree algorithms to optimize network design.
CLOBJ3	Analyze multistage decision problems and implement solutions using dynamic programming techniques.
CLOBJ4	Apply backtracking to solve combinatorial problems such as the N-Queen Problem and Hamiltonian Cycle.
CLOBJ5	Apply branch and bound methods to solve problems such as the Traveling Salesman

f. Course Learning Outcomes:

CLO1	Apply divide-and-conquer techniques to implement and analyze algorithms such as Binary Search, Quick Sort, and Strassen's Matrix Multiplication.
CLO2	Implement dynamic programming solutions for classical problems, including the Trapping Rain Water Problem, Maximum Among Minimums of Subarrays, and Floyd–Warshall Algorithm.
CLO3	Design and implement backtracking algorithms to solve combinatorial problems such as Subset Generation, N-Queens, and Graph Coloring.
CLO4	Apply greedy and optimization techniques to solve scheduling and sequencing problems, including the Job Sequencing Problem and Traveling Salesman Problem.
CLO5	Analyze and evaluate the performance of implemented algorithms in terms of time and space complexity.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		Total
L	T	P	C	MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L-Lectures;**T**-Tutorial;**P-**Practical;**C**-Credit;**MSE-**Mid-SemesterEvaluation,**CE**-Continuous Evaluation, **ESE-**End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Unit–1: Basics of Algorithms-** Introduction to algorithms and their importance, Analysis of algorithms with time and space complexity, Recurrence relations, Master Theorem, Modified Master Theorem, Recursive tree method, Back substitution, and asymptotic notations. **Divide and conquer technique:** Binary Search, Quick Sort, Merge Sort, and Strassen's Matrix Multiplication, Sliding window, 2 pointer algorithm, Bit manipulation - masking.	20	9
2	**Unit–2: Greedy Algorithms-** Introduction to greedy strategy and how it works, Problems based on greedy approach such as Optimal Merge Pattern, Huffman Coding, Minimum Spanning Tree, Knapsack Problem, Job Sequencing with Deadlines, and Single Source Shortest Path algorithms - Dijkstra's Algorithm, Bellman-Ford.	25	12
3	**Unit–3: Dynamic Programming-** Introduction to dynamic programming and its advantages, Problem-solving using dynamic programming techniques including 0/1 Knapsack, Traveling Salesman Problem, Multistage Graphs, Reliability Design, and Floyd–Warshall Algorithm.	25	11
4	**Unit–4: Backtracking-** Concept of backtracking and its applications, Problems such as N-Queen Problem, Hamiltonian Cycle, subset and subset-2, Graph Coloring Problem.	20	09
5	**Unit–5: Branch and Bound & NP Problems-** Introduction to branch and bound technique with examples like Traveling Salesman Problem, Concept of lower bound and its use in solving problems, Introduction to NP-Hard and NP-Complete problems, non-deterministic algorithms, and classification of NP problems.	10	04

i. Text Book and Reference Book:

1. Introduction to Algorithms, 4th Edition Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein MIT Press / McGraw-Hill
2. Fundamentals of Algorithms E. Horowitz et al.
3. Algorithm Design, 1st Edition Jon Kleinberg and Éva Tardos, Pearson
4. Algorithm Design: Foundations, Analysis, and Internet Examples, 2nd Edition Michael T. Goodrich and Roberto Tamassia, Wiley
5. Algorithms – A Creative Approach, 3rd Edition Udi Manber, Addison-Wesley, Reading, MA
6. Algorithms Design and Analysis Harsh Bhasin, Oxford
7. Design and Analysis of Algorithms I. Chandra Mohan, PHI

k. Experiment List:

Sr. NO.	Experiment List
1	Introduction of cisco packet tracer.
2	Create a logical network diagram with eight PCs and switch in cisco packet tracer which are in same network and check for the communication.
3	i. Create a logical network diagram with two different networks, each network contains two pc, one switch and one router. ii. Configure the routing on that scenario. Check the connectivity between different network devices.
4	Perform Man in Middle Attack for DNS spoofing and ARP using Ettercap tool.
5	Setup a VPN in windows operating system.
6	Setup a Proxy in windows operating system.
7	Perform the Wireless recon.
8	Perform the network vulnerability scanning using Nessus tool
9	Perform the NTLM based Brute Force Attack.
10	Perform the network sniffing using Wireshark.
11	Perform the basic network scanning using Nmap tool.
12	Finding the live host in network using advance IP scanning tool.

(2)

j. **Course Name:** Linear Algebra
k. **CourseCode:**03019102BS01
l. **Prerequisite:** Basic Knowledge of Matrix and Determinants

m. Course Learning Objective:

CLOBJ1	Understand the fundamental concepts of matrices, systems of linear equations, and matrix decomposition techniques.
CLOBJ2	Analyze eigenvalues, eigenvectors, diagonalization, and Cayley-Hamilton theorem for solving mathematical problems.
CLOBJ3	Develop understanding of vector spaces, subspaces, basis, dimension, and linear dependence concepts.
CLOBJ4	Apply linear transformations, rank-nullity theorem, and matrix representations in mathematical and engineering applications.
CLOBJ5	Construct orthogonal and orthonormal bases using inner product spaces and Gram–Schmidt orthogonalization process.
CLOBJ6	Apply linear algebra concepts in coding-decoding, data analysis, and computational applications such as Principal Component Analysis (PCA)

n. Course Learning Outcomes:

CLO1	Understand system of linear algebraic equation and solution techniques using matrix
CLO2	Exhibit the understanding of vector space and subspace and solve related problems
CLO3	Compute eigen values and eigenvectors and diagonalize the matrix
CLO4	Create orthogonal and orthonormal bases: Gram-Schmidt process and use bases and orthonormal bases to solve application problem.

o. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
4	**-**	**-**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L-Lectures;**T**-Tutorial;**P**-Practical;**C**-Credit;**MSE**-Mid-SemesterEvaluation,**CE**-Continuous Evaluation, **ESE**-End Semester Examination

p. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Matrices** Introduction, System of linear equations (Homogeneous and Nonhomogeneous systems) by Gauss Elimination, and LU Decomposition Method, Rank, Eigenvalues and Eigenvectors, Algebraic and Geometric Multiplicity, Diagonalization, Cayley-Hamilton theorem and Applications-coding-decoding, Principal Component		

	Analysis (PCA).	**35%**	**21**
2	**Vector Space** Vector spaces over the field of real numbers, Elementary Properties of Vector Spaces, Subspaces, Spanning set, Linear independence and dependence, Basis and Dimension.	**20%**	**12**
3	**Linear Transformation:** Definition of Linear Transformation from R^n to R^m Some Standard Linear Transformation, The Null Space & Column Space, The Rank-Nullity Theorem, Matrix of Linear Transformation.	**25%**	**15**
4	**Inner Product Spaces** Inner-product spaces, norm and its properties, angle between two vectors, orthogonal vectors, orthonormal vector, Gram-Schmidt process, orthonormal basis.	**20%**	**12**

q. Text Book and Reference Book:

1. Elementary Linear Algebra with Applications, (TextBook) By H. Anton | John Wiley
2. Linear Algebra and Its Applications By G. Strang | Brooks/Cole India
3. Advanced Engineering Mathematics By Erwin Kreyszig | Willey India Education
4. Linear Algebra, By K. Hoffman and R. Kunze, | Prentice Hall
5. Calculus By T.M. Apostol | John Wiley Publication | Vol. II
6. Linear Algebra: A Modern Introduction, By D. Poole, | 2nd Edition, Brooks/Cole

(3)

a) **Course Name:** Programming in Python with Full-Stack Development

b) **Course Code:**

c) **Prerequisite:** Basic knowledge of programming and web application

d) **Rationale:** This course provides a broad introduction to Python programming and the development of web applications. It covers using Python as a scripting language for automating tasks and data processing, as well as building and deploying web applications using popular Python frameworks such as Django and Flask.

e. Course Learning Objective:

CLOBJ1	Apply conditional statements and loops to solve computational problems effectively.
CLOBJ2	Handle exceptions effectively and perform file operations to read from and write to files, ensuring robust Python programs.
CLOBJ3	Demonstrate proficiency in using PyCharm IDE, including Git integration, testing with PyTests, and connecting Python applications to databases like SQLite and MongoDB for CRUD operations.
CLOBJ4	Implement routing, URL building, HTTP methods, templates, and handle static and media files in Flask applications.
CLOBJ5	Create Django projects and apps, understand app structure, and work with the admin console for project management.
CLOBJ6	Design and implement RESTful APIs using common HTTP methods such as GET, POST, PUT, and

r. Course Learning Outcomes:

CLO1	Apply JDBC architecture to establish database connectivity and perform CRUD operations with Oracle and MySQL databases.
CLO2	Demonstrate the Servlet lifecycle and use the Servlet API to develop dynamic web applications.
CLO3	Develop JSP-based applications that interact with backend databases to perform CRUD operations.
CLO4	Configure Hibernate using annotations, mapping techniques, generator classes, and database dialects.
CLO5	Implement Dependency Injection and annotation-based configuration to develop loosely

s. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
				Internal Evaluation			ESE		Total
L	T	P	C	MSE	CE	P	Theory	P	
3	-	2	3	20	20	20	60	30	150

L-Lectures;**T**-Tutorial;**P-**Practical;**C**-Credit;**MSE-**Mid-SemesterEvaluation,**CE**-Continuous Evaluation, **ESE-**End Semester Examination

t. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Foundation of Enterprise Programming:** XML, JDBC, JDBC architecture, JDBC with Oracle, MySql, Maven: integration with eclipse, POM.xml	10	03
2	**Servlets:** Basics of Web, Servlet Lifecycle, Servlets API, HTTP Servlets, Servlets Configuration, Servlets Context, Servlets Collaboration, Session Tracking, CRUD operations.	15	04
3	**JSP: Java Server Programming:** Scripting elements, Directive elements, CRUD operations.	15	04
4	**Hibernate:** Architecture, JPA, Generator class, Dialects, Mapping, Annotations, Transaction Management, HQL, HCQL, CRUD operations.	20	06
5	**Spring:** Architecture, Modules, Dependency Injection, Spring AOP, Application Context, annotation-based configuration, MVC CRUD operations	20	07

u. Text Book and Reference Book:

1. Herbert Schildt, Java: The Complete Reference, McGraw-Hill.
2. Cay S. Horstmann, Core Java – Volume I & II, Pearson.
3. Joshua Bloch, Effective Java, Addison-Wesley.
4. Kathy Sierra & Bert Bates, Head First Java, O'Reilly.

l. Experiment List:

Sr. NO.	Experiment List
1	Develop a JDBC application to connect with MySQL database and perform CRUD operations.
2	Develop a JDBC application to connect with Oracle database and perform CRUD operations.
3	Create a Maven project in Eclipse and configure dependencies using pom.xml.
4	Develop a Servlet to demonstrate Servlet Lifecycle methods (init(), service(), destroy()).
5	Create an HTTP Servlet to handle form data and implement session tracking techniques (Cookies/HttpSession).
6	Develop a JSP application demonstrating scripting elements and directive elements.
7	Develop a JSP–Servlet–JDBC based web application to perform CRUD operations.
8	Create a Hibernate application using annotations and mapping to perform CRUD operations.
9	Implement HQL queries and demonstrate transaction management in Hibernate.
10	Develop a Spring MVC web application implementing Dependency Injection and CRUD operations.

(4)

a. **Course Name:** Artificial Intelligence
b. **Course Code:**
c. **Prerequisite:** Basic knowledge of programming, data structures (trees and graphs), algorithms, and fundamental mathematics (probability and linear algebra).
d. **Rationale:** This course introduces the core concepts of Artificial Intelligence, including intelligentagents,search techniques, fuzzy logic, and neural networks, enabling students to develop intelligent systemsandbuild a foundation for advanced AI and Machine Learning applications.
e. Course Learning Objective:

CLOBJ1	Analyze AI Problems and Apply Various Techniques for Problem Solving.
CLOBJ2	Solve Game Playing Problems.
CLOBJ3	Design Artificial Neural Network.
CLOBJ4	Design Expert System is designed and how Knowledge Engineering works.
CLOBJ5	Analyze the structure and elements of neural networks, implement perceptrons and back-propagation algorithms, and apply neural networks to real-world problems

f. Course Learning Outcomes:

CLO1	Apply basic programming constructs such as conditional statements, loops, anddatastructures to solve logical and computational problems.
CLO2	Develop Python programs to perform numerical computations, matrix operations, anddataprocessing tasks.
CLO3	Implement classical AI problems such as Water Jug and N-Queens using appropriateproblem-solving strategies. 4
CLO4	Apply recursion and rule-based programming concepts in Prolog to solve problems suchasfactorial, Fibonacci, and temperature conversion.
CLO5	Develop logic-based and file-handling applications using Python and Prolog for practicalproblem-solving.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	2	4	60	20	30	20	20	150

L-Lectures;**T**-Tutorial;**P**-Practical;**C**-Credit;**MSE**-Mid-SemesterEvaluation,**CE**-Continuous Evaluation, **ESE**-End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction:** Overview and Historical Perspective, • Artificial Intelligence (AI) definition, Goals of AI, History of AI, Applications of AI, Agents, Difference between human intelligence vs. artificial intelligence	15	08
2	**Agents and Environments:** Agent Terminology, Types of Agents − Simple Reflex Agents, Model Based Reflex Agents, Goal Based Agents, Nature of Environments, Properties of Environments	20	09

3	**Search Algorithms:** Terminology, Brute Force Search Strategies − Breadth First Search, Depth First Search, Heuristic Search Strategies, Local Search Algorithms.	**20**	**09**
4	**Fuzzy Logic Systems:** Introduction to Fuzzy Logic and Fuzzy systems, Membership functions, Fuzzification, Defuzzification	**20**	**09**
5	**Neural Networks:** Basic structure of Neural Networks, Neural Network Elements, Perceptron, Back-propagation, Application of neural network	**25**	**10**

i. Text Book and Reference Book:

1. Artificial Intelligence (TextBook) By Elaine Rich and Kevin Knight | TMH
2. Artificial Intelligence: A New Synthesis, Harcourt Publishers By N. J. Nilsson | Harcourt Publishers
3. "Artificial Intelligence: A Modern Approach" Author: Stuart Russell and Peter Norvig |Publisher: Pearson

j. Experiment List:

Sr. NO.	**Experiment List**
1	Write a program that takes two inputs (0 or 1) and simulates the behavior of AND, OR, and NOT gates using ifelse statements.
2	Create a list of 10 numbers. Write a script to find the maximum, minimum, and the average without using builtin functions like max() or sum().
3	Create a "Dictionary" that stores 5 AI terms and their definitions. Allow the user to type a term to "look up" the definition.
4	Install the NumPy library. Create two 2 X 2 matrices and perform addition and matrix multiplication.
5	Write a prolog program for Temperature Conversion
6	Write a program to implement Water Jug Problem.
7	Write a prolog program to Calculate Factorial.
8	Write a prolog program to Create Fibonacci Series.
9	Write a program to implement N Queens Problem.
10	Write a prolog program to Create a text file.

(5)

a. **Course Name:** Azure Fundamentals
b. **CourseCode:**
c. **Prerequisite:** Basic computer fundamentals and introductory programming knowledge.
d. **Rationale:** This course introduces students to cloud computing fundamentals using Microsoft Azure, focusing on conceptual clarity, employability skills, digital infrastructure awareness, and industry relevance..

e. Course Learning Outcomes:

CLOBJ1	Apply fundamental Azure concepts to analyze simple cloud deployment scenarios.
CLOBJ2	Apply knowledge of Azure services to analyze simple cloud-based solution scenarios.
CLOBJ3	Implement basic access control using role-based access control (RBAC) principles.
CLOBJ4	Analyze factors that influence cloud service costs and apply basic cost-optimizationconcepts.
CLOBJ5	Apply Azure Service Level Agreements (SLAs) to assess reliability and availabilityofcloud services.

f. **Course Learning Outcomes:**

CLO1	Create and manage Azure resources using the Azure portal, resource groups, and Azure Resource Manager templates. Deploy and configure virtual machines and cloud-based storage solutions to meet application and data requirements. Implement secure access and role-based permissions for Azure resources using network controls and RBAC.
CLO2	Monitor and manage the performance, availability, and health of Azure resources using Azure Monitor.
CLO3	Analyze and control Azure costs effectively to optimize cloud expenditure and resource utilization
CLO4	Create and manage Azure resources using the Azure portal, resource groups, and Azure Resource Manager templates. Deploy and configure virtual machines and cloud-based storage solutions to meet application and data requirements. Implement secure access and role-based permissions for Azure resources using network controls and RBAC.
CLO5	Monitor and manage the performance, availability, and health of Azure resources using Azure Monitor.

Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	2	4	60	20	30	20	20	150

L-Lectures;**T**-Tutorial;**P**-Practical;**C**-Credit;**MSE**-Mid-SemesterEvaluation,**CE**-Continuous Evaluation, **ESE**-End Semester Examination

Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Azure Cloud Concepts:** Microsoft Azure as a cloud service provider, Azure global infrastructure, Azure resource organization, Azure management basics, and Azure cloud service models (IaaS, PaaS, SaaS).	15	08
2	**Azure Services:** Overview of various Azure services and their common use cases, including Azure compute services, Azure storage services, Azure database services, and an introduction to serverless computing concepts (Azure Functions).	20	08

3	**Security, Privacy, Compliance, and Trust:** Shared responsibility model in cloud computing, identity and access management in Azure, Microsoft Entra ID (Azure Active Directory – introduction), role-based access control (RBAC), data protection and encryption basics, and Azure governance and compliance concepts.	**25**	**10**
4	**Azure Pricing and Support:** Azure subscription options, pricing models and billing concepts, overview of the Azure pricing calculator, and different support options available to Azure customers.	**15**	**10**
5	**Azure SLA and Service Lifecycles:** Azure Service Level Agreements (SLAs), service availability and uptime concepts, Azure service lifecycle including planned maintenance, updates, service retirement, and deprecation policies.	**25**	**09**

k. Text Book and Reference Book:

1. Microsoft Azure Fundamentals: Understanding Azure Michael Collier and Robin Shahan3rd Edition
2. Azure for Architects: Implementing Cloud Design, DevOps, Containers, IoT, and ServerlessSolutions on Your Public Cloud Ritesh Modi 2nd Edition
3. Exam Ref AZ-900: Microsoft Azure Fundamentals Jim Cheshire 2nd Edition

g. Experiment List:

Sr. NO.	Experiment List
1	Explore the Azure Portal and create the first cloud resource for a startup beginning its cloudjourney.
2	Deploy a virtual machine in Azure to migrate an existing on-premises application without changingitsarchitecture.
3	Configure secure network access for an Azure virtual machine to allow only authorizedusersandrestrictunwanted internet traffic.
4	Implement cloud-based storage in Azure to provide scalable and reliable access to images, videos,anddocuments from anywhere.
5	Apply Azure Resource Locks to prevent accidental deletion or modification of critical productionresources.
6	Manage Azure resource groups to logically organize development, testing, and productionresourcesforeasier management and monitoring.
7	Implement Azure Role-Based Access Control (RBAC) to assign appropriate permissions todevelopers,testers, and administrators.
8	Monitor Azure resources using Azure Monitor to ensure 24×7 availability, performance tracking,issuedetection, and service health monitoring.
9	Review and manage Azure costs effectively by analyzing usage and controlling cloudexpenditure.
10	Deploy resources using Azure Resource Manager (ARM) templates to automate the creationofidenticalcloud environmnts for development