Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022
'B^{++}' Grade (CGPA 2.96)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: B.C.A.

Name of the Course: B.C.A. II (Sem.– III & IV)

(Syllabus to be implemented from June 2023)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Choice Based Credit System (CBCS)(w.e.f.2023-24)
Revised Structure for BCA-II

Subject/ Core Course	Name and Type of the Paper			Paper No.	No. of papers/ Practical (Hrs./week)			Total Marks Per Paper	UA	CA	Credits
	Type		Name		L	T	P				
Class :			**BCA - II Semester -III**								
****Core Courses DSC 1C and DSC 2C are compulsory while student can select either # DSC 3C/GE-3C or AIC-1A as a third subject.	DSC 1C	AIC-1A	Object Oriented Programming using Java-I	Paper-V	3	--	--	50	40	10	4.0
			Data Structure Using 'C'-I	Paper-VI	3	--	--	50	40	10	
	DSC 2C		Database Management System-I	Paper-V	3	--	--	50	40	10	4.0
			Software Engineering	Paper-VI	3	--	--	50	40	10	
	# DSC 3C/GE-3C		FA Using Tally	Paper-V	3	--	--	50	40	10	4.0
			Operating System-II	Paper-VI	3	--	--	50	40	10	
Total Sem-III					**18**	--	--	**300**	**240**	**60**	**12**
	$SEC-1		Web Technology Using PHP		4	--		100	80	20	4
Class :			**BCA - II Semester – IV**								
****Core Courses DSC 1D and DSC 2D are compulsory while student can select either # DSC 3D/GE-3D or AIC-1B as a third subject.	DSC 1D	AIC-1B	Object Oriented Programming using Java-II	Paper-VII	3	--	--	50	40	10	4.0
			Data Structure Using 'C'-II	Paper-VIII	3	--	--	50	40	10	
	DSC 2D		Database Management System-II	Paper-VII	3	--	--	50	40	10	4.0
			Software Testing & QA	Paper-VIII	3	--	--	50	40	10	
	# DSC 3D /GE-3D		Digital Marketing	Paper-VII	3	--	--	50	40	10	4.0
			Python-II	Paper-VIII	3	--	--	50	40	10	
			Environmental Studies		3	--	--	50	40	10	NC
Total Sem-IV					**18**			**300**	**240**	**60**	**12**
Total (Theory)					**36**	--	--	**600**	**480**	**120**	**24**
Core Practical	DSC 1C & 1D			Pr. II &III	--	--	8	200	160	40	4.0
	DSC 2C & 2D			Pr. II & III	--	--	8	200	160	40	4.0
	DSC 3C & 3D /GE-3C &GE-3D		AIC 1A & 1B	Pr. II & III	--	--	8	200	160	40	4.0
Total (Practical's)							**24**	**600**	**480**	**120**	**24**
Grand Total					**36**		**24**	**1800**	**960**	**240**	**48**
	$SEC				**4**			**100**	**80**	**20**	**4**

******Core Courses: DSC 1C, DSC 2C, DSC 1D and DSC 2D (Core computer science courses)**
 # Generic Electives: DSC 3C/GE-3C and DSC 3D /GE-3D: Commerce/Management
Additional Interdisciplinary Courses – Cyber Law/Bioinformatics /Optimization technics/Data Analytics /NCC.
$The students can choose MOOCs/ NPTEL/SWAYAM/Pathshala/Add-on / Skill based courses of university/college initiated courses of same credits.
$ These courses are not compulsory, but after completion of these courses students get additional credits on their mark lists.
$ SEC courses run by colleges should be communicated to university for information & necessary action.

BCA-II Semester- III

Course Code: DSC1C (Paper-V) **Course Title: Object Oriented Programming using Java-I**
Total Contact Hours: Hrs. **Total Marks: 50(40 Lectures)**
Teaching Scheme: Theory 3 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
1	**Introduction to java programming:** Features of Java, JVM, parts of java, steps to java programming, API Document, starting java programming, importing classes, Formatting the output, naming conventions , Data types, Operators, control statements, switch statement, break statement, continue statement, and return statement, Input/output-accepting input from the keyboard and display output with formatting.	**12**
2	**Arrays:** Definition, types of array- single- dimensional, multi-dimensional and jagged array, array length property, array by command line argument. **String**: Concepts, String class methods, String comparison, immutability of string, Difference between mutable and immutable object String buffer and Builder: Creating string buffer objects, String buffer class methods, String builder class, String builder class methods, String vs StringBuffer, StringBuffer vs StringBuilder. **OOPs Concept in java:** Introduction to OOP's, features of OOP's, access specifiers, constructor, Class and object: Object creation, initializing instance variables, Methods in java- instance method ,static method, 'this ' keyword, passing primitive data types to method, passing objects to method, passing arrays to method	**14**
3	**Inheritance and polymorphism:** Inheritance Introduction, use of inheritance , types of inheritance, 'super ' keyword, use of protected access specifier, **Polymorphism-** Introduction, static and dynamic Polymorphism. Method overriding, method overload vs method overriding., use of 'final' keyword, Abstract method and class, **Interface-** Introduction, multiple inheritance using interfaces, Abstract class vs. interfaces **Packages:** Introduction to package ,types of packages-Built in and user defined package, creating and importing package, relating sub package in package, interfaces in package, access specifier in package, use math package. **Java I/O and stream:** Streams, OutputStream vs InputStream, OutputStream class, InputStream class, Hierarchy of OutputStream and InputStream class, Java FileWriter class, Java FileReader class, file class methods, creating file, reading file ,file copy, serialization and de- serialization in file. **Exception handling:** Concept and use, Exception Handling classes, Try-catch block, Multiple Catch Block, Nested try, Finally Block, Throw Keyword Throws Keyword, Throw vs Throws ,Final vs Finally, Custom Exceptions	**14**

Books Recommended:

1) Core Java by Dr.R. Nageshwar Rao
2) "Programming with Java" by E Balaguruswamy.
3) Horstmann, "Computing Concepts with Java 2 Essentials", John Wiley.
4) Decker & Hirshfield, "Programming Java", Vikas Publication
5) "Java-2 the complete Reference" by Patrick Naughton and HerbertzSchidt.

BCA-II Semester- III

Course Code: DSC1C (Paper-VI) **Course Title: Data structures Using 'C'- I**
Total Contact Hours: Hrs. **Total Marks: 50(40 Lectures)**
Teaching Scheme: Theory 3 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
1	**An Introduction to Data Structures:** Introduction, Definition and types of Data structure. Abstract Data Type (ADT)- ADT for array, ADT for stack, ADT for queue. Algorithm: Definition, characteristics of algorithm. **Complexity of algorithm**- Space complexity, time complexity, Big-O Notation Design strategies of Algorithm- Divide and Conquer, Greedy Algorithm, branch & bound, backtracking, and dynamic programming. **Array:** Introduction to Array, types of array- one dimensional, two dimensional and multidimensional, Operations of array	**10**
2	**Stack:** Introduction to Stack, Operations of stack- Create, isempty, isfull, push, pop, display, Implementation of stack using array (Static Implementation) Applications of Stack-Conversion of infix expression to postfix expression, Conversion of infix expression to prefix expression, Matching parenthesis in an expression (Checking expression is valid or invalid), Evaluation of postfix expression, Stack in recursion, Implementation of applications of stack. **Queue:** Introduction to Queue, Operations of queue- Create, isempty, isfull, insert, remove, display , Types of Queue- Linear Queue, Circular Queue, Deque (Double Ended Queue), Priority queue. Implementation of all types of queue using array (Static Implementation), Difference between stack and queue, Applications of Queue	**15**
5	**Linked Lists:** Introduction to Linked Lists, Difference between Array and linked list. Types of linked list- 1) Linear linked list- Singly (Single) linear linked list and Doubly (Double) linear linked list. 2) Circular linked list- Singly (Single) circular linked list and Doubly (Double) circular linked list, Operations of linked list- Creation, Insertion, Deletion, Traversing, Searching, Display, count, reverse, Implementation of all types of linked list, Implementation of stack using linked list ,Implementation of queue using linked list	**15**

Books Recommended:

1. Tanenbaum: Data structures using C and C++
2. Data Structures Through C in Depth- S.K.Srivastava, D.Srivastava
3. Fundamentals of *Data Structures in C by Sahni*

BCA-II Semester- III

Course Code: DSC2C (Paper-V) **Course Title: Database Management System-I**
Total Contact Hours: Hrs. **Total Marks: 50(40 Lectures)**
Teaching Scheme: Theory 3 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
Unit-1	**Introduction to Database Management System:** Definition, Limitations of traditional file system, Advantages of DBMS, Components of DBMS, Database Users, Database Structure **Database Architecture**- 2-tier and 3 level (schema) tier architecture, Instances and Schemas, Database languages, Data Independence, Types of data models(Hierarchical, Network, Relational, hybrid) **Conceptual Design**: E-R model-entities, attributes and its types, Relationship, Relationship sets, Generalization, Specialization, Aggregation **Relational Database Concepts**: Difference between DBMS and RDBMS, Introduction and features of RDBMS, 12 Codd's Rules.	**10**
Unit-2	**SQL Commands:** DDL Commands: Create, Alter, Rename, truncate, drop. DML-Insert, update, delete. , DQL-SELECT Statements using WHERE clause. DCL- Grant, Revoke, TCL-Rollback, Commit and Savepoint, **User Creation:** Creating users Granting & Revoking permissions on Database Objects **Data types and Operators:** comparison, conditional, arithmetic, logical, set and Special Operators – IN (NOT IN), BETWEEN (NOT BETWEEN), LIKE (NOT LIKE), IS NULL (IS NOT NULL) **Built-in Functions:** Arithmetic, string, Date and Time, Conversion, Aggregate, OLAP and General. Common clause: Order by, Group by, having. **Integrity Constraints:** Importance of Data Integrity, NOT NULL, UNIQUE, PRIMARY, FOREIGN KEY constraint with ON DELETE, ON DELETE CASCADE, CHECK, DEFAULT constraints. **Relational Algebra operations:** Select, Project, Cartesian Product, Union, Set Difference and Join. **SQL Joins:** Equi Join/Inner Join/Simple Join, Cartesian, Non-Equi, Outer Joins, Self-Join and lossless join.	**20**
Unit-3	**Purpose and usage of a View:** Types of VIEWS, Relational Views, Object Views, Using VIEWS for DML Operations, In-Line View, Forced Views, Putting CHECK Constraint upon VIEWS, Creation of READ ONLY VIEWS, Materialized Views **Working with Sub Queries and Nested Sub Queries:** purpose and usage of a Sub Query, Type of Sub Queries- Single Row, Multiple Row, Multiple Column, Applying Group Functions in Sub Queries, IN, ANY, SOME, ALL Operators in Sub Queries. Correlated Sub Queries: Handling Data Retrieval with EXISTS and NOT EXISTS Operators **Working with Sequences-** Creating, retrieving data, modifying, dropping sequences, Synonyms, **Index-** What is index, advantages Types of indexes, creating index, Retrieving data using index, Pseudo Columns: Types of Pseudo Columns, CURRVAL and NEXTVAL, LEVEL, ROWID, ROWNUM.	**20**

Books Recommended:

1) Database System Concepts by Korth Silberschetz
2) Fundamentals of Database Systems by Elmsari, Navathe
3) SQL and PL/SQL Programming by Ivan Bayross
4) SQL and PL/SQL Programming by Oracle Press

BCA-II Semester- III

Course Code: DSC2C (Paper-VI) **Course Title: Software Engineering**
Total Contact Hours: Hrs. **Total Marks: 50(40 Lectures)**
Teaching Scheme: Theory 3 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
Unit-1	**System concepts:** Introduction of system, characteristics, Elements of system, Types of system, System Analysis, Role of System Analyst. **Software Engineering:** Definition, Characteristics of software, Qualities of software. **System Development life cycle-** Waterfall model, V-shape model, Spiral model, Prototyping, incremental, RAD, Agile.	**10**
Unit-2	**Software requirements**: Types of Requirements: System, Functional, Non-functional, User. **Fact finding techniques**: Interviews, Questionnaire, Record reviews, Observation Analysis and Design Tools: Flow chart, Decision tables and Trees, Structured English, HIPO **System Design**: Data Flow Diagram (Physical, Logical), Entity Relation Diagram ERD Case studies: Inventory, Library, Payroll, Loan, Online Booking, Data Dictionary, structured chart, Input and output design, Database Design: Types of Dependencies, Normalization(1NF, 2NF, 3NF, BCNF, 4NF, 5NF),	**15**
Unit-3	**Coding:** Coding standards, Size Estimation, Effort Estimation, and Cost Estimation, Testing fundamentals **Software Implementation and Maintenance**: Traditional and incremental approaches, conversion methods, Overview of maintenance process, types of maintenance. **Software Quality Assurance**: SQA Tasks, Goals and Metrics, Software Reliability. Software risk management: definition, types of risk, risk identification-risk monitoring and management.	**15**

Books Recommended:

1. Analysis and Design of Information Systems by James Senn.
2. Practical guide to structure System Design By Miller/Page/jones.
3. Software Engineering by Pressman.
4. System Analysis and Design by Parthsarty

BCA-II Semester- III

Course Code: DSC 3C/GE-3C (Paper-V) **Course Title: Financial Accounting with Tally**
Total Contact Hours: Hrs. **Total Marks: 50 (40 Lectures)**
Teaching Scheme: Theory 3 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
Unit-1	**Introduction to Book-keeping and Accountancy-** Definition and Objectives, Importance of Book-keeping, Difference between Book-keeping and Accountancy, Definition of Accountancy, Basis of Accounting System, characteristics of accounting information, Basic Accounting Terminologies, Accounting Concepts, Conventions and Principles, Accounting Standards (AS) and IFRS **Fundamentals of Double Entry Book-keeping-** Introduction of Double entry Book-keeping System, Methods of Recording Accounting Information (Indian, Single, Double), Advantages of Double entry Book-keeping system, Classification of Accounts, Golden Rules of Debit and Credit (Traditional Approach), Modern Approach of Rules of Accounts, Accounting Equations **Journal-** Importance and Utility of Accounting Documents, Definition, Importance and Utility of Journal, Specimen of Journal, GST Basics, Recording of Journal entries with GST.	**12**
Unit-2	**Subsidiary-Books-**Introduction and need for maintaining Subsidiary Books, Cash Book with Cash Column, Cash Book with Cash and Bank Columns, Simple and Analytical Petty Cash Book under Imprest System, Purchase Book, Purchase Return Book, Sales Book, Sales Return Book, Journal Proper. **Ledger-** Definition and Importance of Ledger, Specimen of Ledger, Posting of entries from Journal/Subsidiary Books to Ledger, Balancing of Ledger Accounts, Preparation of Trial Balance **Depreciation-** Introduction and Importance of Depreciation, Factors of Depreciation, Methods of Depreciation, Accounting Treatment for Depreciation. **Rectification of Errors-**Introduction and Effects of errors, Types of Errors, Detection & Rectification of errors, Preparation of Suspense Accounts	**14**
Unit-3	**Final Accounts of a Proprietary concern-** Introduction, Objectives and Importance of Final Accounts, Specimen of Trading Account, Profit and Loss Account & Balance Sheet. Effects of following adjustments. Closing stock, Outstanding Expenses, Prepaid Expenses, Depreciation on assets, Bad debts and R.D.D., Discount on Debtors and Creditors, Income received in advance , Accrued Income, Goods distributed as free sample, Goods withdrawn by proprietor for Personal use, Interest on capital, Interest on Drawings **Implementation through Tally** Create, Alter & Display Stock Groups and Stock Items, All inventory voucher types and transactions Inventory details in accounting vouchers. Reports like Stock summary, Inventory books like Stock item, Group summary, Stock transfers, Physical stock register, Movement analysis, Stock group & item analysis, stock category analysis Ageing analysis, Salesorder & Purchase order book, Statement of inventory related to Godowns,	**14**

	categories, stock query, Reorder status, Purchase & Sales order summary, Purchase & Sales bill pending, Exception reports like negative stock& ledger, overdue receivables & payables, memorandum vouchers, optional vouchers, post-dated vouchers, reversing journal	

Books Recommended:

1) Elements of double entry book keeping – Batliboi
2) Advanced Accounts – M.C.Shukla, T.S.Grewal and S.C.Gupta
3) An Introduction to Accountancy – S.N.Maheshwari.
4) Accounting for Management – S.K.Bhattacharyya& John Dea

BCA-II Semester- III

Course Code: DSC 3C/GE-3C (Paper-VI) **Course Title: Operating System-II**
Total Contact Hours: Hrs. **Total Marks: 50 (40 Lectures)**
Teaching Scheme: Theory 3 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
Unit-1	**Deadlocks**: Definition, Characteristics, Resource Allocation Graph, Methods of Handling Dead Locks- Deadlock Prevention, Deadlock Avoidance, Deadlock detection and Recovery.	**10**
Unit-2	**Memory Management:** Basic, Address Binding, Logical &Physical address Space, Dynamic Loading, Overlays, Memory partitioning: Fixed and Variable, Contiguous Memory allocation, Allocation Strategies(First Fit, Best Fit, Worst Fit),Swapping, fragmentation, compaction, Paging and Segmentation. **Virtual Memory:** demand paging, Page fault, Page Replacement policies: Optimal(OPT), First in First Out(FIFO),Least Recently used(LRU), Thrashing.	**15**
Unit-3	**Storage Management:** File concept, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping). **Disk Management:** disk structure, disk scheduling (FCFS, SSTF, SCAN, CSCAN), disk reliability, disk Formatting, boot block, bad blocks.	**15**

Books Recommended:

1. Operating System Concepts by Siberchatz and Galvin.
2. Modern O.S. By Andrews Tanenbaum.

BCA-II Semester- III

Course Code: $ SEC-I **Course Title: Web Development using PHP**
Total Contact Hours: Hrs. **Total Marks: 100 (60 Lectures)**
Teaching Scheme: Theory 4 Lect./Week **Total Credits: 04**

Unit No	Content	No. of Lectures
1	**Introduction to web applications**: Client Side Vs Server Side Scripting WebServers - Local Servers and Remote Servers, Installing Web servers, Static website vs Dynamic website development. **Introduction to PHP and PHP Framework:** Basic PHP syntax, Data types in PHP, Variables, Constants, operators and Expressions, printing data on PHP page, **Control statements**–if, switch case, for, while, do while. **Arrays:** Initialization of an array, Iterating through an array, Sorting arrays, Array Functions, types of array **Functions**: Defining and Calling Functions, Passing by Value and passing by references, Inbuilt Functions.	10
2	**String**: Formatting String for Presentation and Storage, Joining and Splitting String, Comparing String, Matching and replace Substring, patterns, basic regular expressions. **Working with file and Directories**: Understanding file& directory, Opening and closing a file, Coping , renaming and deleting a file, Working with directories, Building a text editor, File Uploading & Downloading, Generating Images with PHP-Basics of computer Graphics, Creating Image, Manipulating Image, Using text in Image. **Error And Exception Handling**: Error Logging, Configuration Directives, PHP's Exception Class, Throw New Exception, Custom Exceptions, Date and Time Functions, HTTP Authentication, PHP Authentication, Authentication Methodologies **State Management:** **Cookies**: Setting time in a cookie with PHP, Deleting a cookie, Creating session cookie, Working with the query string **Session**: Starting a session, Registering Session variables, working with session variables, destroying session, passing session Ids, encoding and decoding session variables, Auto-Login, Recently Viewed Document Index	15
3	**Working With Forms**: Forms controls properties, methods and events, Retrieving form data with $_POST, $_GET and $_REQUEST arrays, Validating retrieved data, Strategies for handling invalid input, Super global variables, Super global array, Importing user input, Accessing user input, Combine HTML and PHP code, Using hidden fields, Redirecting the user, File upload and scripts, Validation-Server-side validation, Client-side validation. **Database Connectivity with Php**: Database Functions, Gmail Data Grid options SQL Injection, Uploading and downloading images in Database, Registration and Login forms with validations, Paging, Sorting	15

Books Recommended:

1) PHP: The Complete Reference-Steven Holzner.
2) Programming PHP- Rasmusler dorf, Kevin Tatroe.

BCA-II Semester- IV

Course Code:DSC1D Paper-VII **Course Title: Object Oriented Programming using Java-II**

Total Contact Hours: Hrs. **Total Marks: 50(40 Lectures)**

Teaching Scheme: Theory 3 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
1	**Collection Framework**: Type casting, types of type casting **Wrapper classes**: use of Wrapper classes, Number classes(Long,Integer,Byte,Short,Float and double) and importance methods of Number class, Character class and importance methods of character class, auto boxing and unboxing, **Collection Framework**:-Use of Collection framework, Hierarchy of Collection Framework, Collection objets-Set,List, Map, Queue **Collection classes**-Stack,ArrayList,vector,Linked List,priority queue,HashSet,LinkedHashSet,Sotred Set,TreeSet,Hashtable and HashMap	**10**
2	**Multithreading:** Single tasking, Multi-tasking, use of thread, creating and running thread, terminating thread, thread class methods, multiple threading, Thread communication, thread priorities,Application of thread and thread life cycle. **Networking:** Introduction to Networking, TCP/IP protocol, UPD protocol, socket programming, InetAdress Class, URL Connection class, communication between client and server, two way communication between client and server.	**15**
3	**Swing:** Hierarchy of Swing classes JButton, JLabelJava ,JTextField, JTextArea, JPasswordField, JCheckBox, JRadioButton,JComboBox, , JList, JOptionPaneJava JScrollBar, JMenuItem & JMenuJava , Image **Event hadling**:- Java Event Handling, Java Event classes and Listener interfaces. LayoutManager- BorderLayout FlowLayout, GridLayout, CardLayout , BoxLayout **JDBC**: Introduction, JDBC Driver, DB Connectivity Steps ,Connectivity with Oracle or MySql DriverManager, ConnectionStatement, ResultSet, PreparedStatement, ResultSetMetaData, CallableStatement	**15**

Books Recommended:

1) Core Java by Dr.R. Nageshwar Rao
2) "Programming with Java" by E Balaguruswamy.
3) Horstmann, "Computing Concepts with Java 2 Essentials", John Wiley.
4) Decker & Hirshfield, "Programming Java", Vikas Publication
5) "Java-2 the complete Reference" by Patrick Naughton and HerbertzSchidt.

BCA-II Semester- IV

Course Code: DSC1D Paper-VIII **Course Title: Data structures using 'C'- II**
Total Contact Hours: Hrs. **Total Marks: 50(40 Lectures)**
Teaching Scheme: Theory 3 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
1	**Trees:** Introduction to Tree, Introduction to Binary Trees, Types of Binary tree- Strictly Binary tree, Complete Binary tree, Extended (2-Tree) Binary tree, Binary expression tree, Binary Search tree, Heap Tree- Min heap tree, Max heap tree, Representation of Binary tree using- Array, Linked list Operations of Binary search tree-Creating and inserting node, Searching node, Counting total nodes, Counting and displaying leaf nodes, Tree Traversal methods- Preorder, Inorder, Postorder, Deletion of Nodes, Implementation of binary search tree, Height balanced tree/Balanced Binary Tree/AVL tree, Application of tree	**10**
2	**Graph:** Concept & terminologies used in graph, Graph Representation using- Array and linked list, Graph traversals – BFS & DFS, Dijakstra's shortest path algorithm, and application of graph.	**10**
3	**Sorting:** Introduction and definition of Sorting, Types of Sorting-Bubble sort, Quick sort, Shell sort, Selection sort, Insertion sort, Heap Sort, Merge sort, Radix Sort, Tree Sort techniques **Searching:** Introduction and definition of Searching, Types of searching-Linear (Sequential) Search, Binary Search, Indexed sequential search, Hashing and different Hash functions.	**20**

Books Recommended:

1. Tanenbaum: Data structures using C and C++
2. Data Structures Through C in Depth- S.K.Srivastava,D.Srivastava
3. Fundamentals of *Data Structures in C by Sahni*
4. Ulman: Data structures and Algorithms
5. Nikaulus Wirth: Algorithms, data structures, Programs.

BCA-II Semester- IV

Course Code: DSC2D Paper-VII **Course Title: Software Testing**
Total Contact Hours: Hrs. **Total Marks: 50(40 Lectures)**
Teaching Scheme: Theory 3 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
Unit-1	**Importance or need of software testing:** **White Box Testing**: Introduction, Advantages and Disadvantages of White box testing, Static Techniques: Informal Reviews, Walkthroughs, Technical Reviews, Inspection, Dynamic Techniques or Structural Techniques-Statement Coverage Testing, Branch Coverage Testing, Path Coverage Testing, Conditional Coverage Testing, Loop Coverage Testing **Black Box Testing:** Introduction, Advantages and Disadvantages of black box testing, Black Box Techniques: Boundary Value Analysis, Equivalence Class Partition, State Transition Technique, Cause Effective Graph, Decision Table, Use Case Testing Experienced Based Techniques: Error guessing, Exploratory testing	**12**
Unit-2	**Levels of Testing** **Functional Testing:** Integration Testing and types - Top Down , Bottom Up , Non Incremental, System Testing, Acceptance Testing- Alpha and Beta, Smoke Testing, Regression Testing- Unit , Regional, Full **Non Functional Testing:** Adhoc Testing, Performance Testing : Load Testing, Stress Testing, Volume Testing, Soak Testing, Recovery Testing Test cases design Techniques: Test Case and types, Test Case Template, write a test case and examples, Preparing Review Report	**12**
Unit-3	Software Test Life Cycle, Writing Test Plan, Preparing Traceability Matrix, Writing Test Execution Report and Summary Report. Difference between Bug, Defect, Failure, Error, Bug/Defect Life Cycle, Defect Tracking and Reporting, Types of Bugs, Identifying the Bugs, Reporting the Bugs Introduction to automated testing: Differences between Manual and Automation Testing, Install and configure selenium testing tool, Case study through selenium tool: Design test case for Email login page, Internet Banking Login, Online shopping.	**16**

Books Recommended:

1) The art of Software Testing–Glenford J. Myers
2) Lessons learned in Software Testing– Cem Kaner, James Bach, Bret Pettichord
3) A Practitioner's Guide to Software Test Design- Lee Copeland
4) Software Testing Techniques, 2ndedition- Boris Beizer

BCA-II Semester- IV

Course Code: DSC2D Paper-VIII **Course Title: Database Management System-II**
Total Contact Hours: Hrs. **Total Marks: 50(40 Lectures)**
Teaching Scheme: Theory 3 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
Unit-1	Introduction of Transaction, ACID properties, transaction states, scheduling and its types, conflict and view serializability, Introduction of Concurrency Control, problems of concurrency control, lock based protocols, timestamp based protocol, deadlock, deadlock handling methods.	**12**
Unit-2	Introduction, recovery algorithms, log base recovery, shadow paging, recovery with concurrent transaction, checkpoints or syncpoints or savepoints. Query Optimization: Overview Query Processing and Optimization – Heuristics and Cost Estimates in Query Optimization.	**8**
Unit-3	**Introduction to PL/SQL:** Advantages, Architecture, Data types, Variable and Constants, Using Built-in Functions, Conditional, Looping and Iterations Statements, Selection Case, Simple Case, GOTO Label and EXIT, SQL within PL/SQL. Procedures in PL/SQL: STORED PROCEDURES, PROCEDURE with Parameters (IN, OUT and IN OUT), POSITIONAL Notation and NAMED Notation, Dropping a Procedure. **Functions in PL/SQL**: Difference between Procedures and Functions, types of functions and parameter modes, **Packages in PL/SQL**: importance, advantages Implementing packages, Private and Public Objects in PACKAGE **Cursor in PL/SQL**: Types of Cursors, Cursor Attributes, Cursor with Parameters, Cursors with LOOPs Nested Cursors, Cursors with Sub Queries and procedure. **Exceptions in PL/SQL**: Types of exceptions, RAISE_APPLICATION_ERROR, PRAGMA_AUTONOMOUS_TRANSACTION **Database Triggers in PL/SQL**: Types of Triggers, Row Level Triggers, Statement Level Triggers, Implementing triggers for various DML operations (insert, delete, update), DDL Triggers, Trigger Auditing.	**20**

Books Recommended:

1) Database System Concepts by Korth Silberschetz
2) Fundamentals of Database Systems by Elmsari, Navathe
3) SQL and PL/SQL Programming by Ivan Bayross
4) SQL and PL/SQL Programming by Oracle Press

BCA (Science)-II Semester- III

Course Code: # DSC 3D /GE-3D **Course Title: Digital Marketing**
Total Contact Hours: Hrs. **Total Marks: 50 (40 Lectures)**
Teaching Scheme: Theory 6 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
Unit-1	**Introduction to Digital Marketing:** Meaning of Digital Marketing, Differences from Traditional Marketing, Return of Investments on Digital Marketing vs. Traditional Marketing, E Commerce, Tools used for successful marketing, SWOT Analysis of Business for Digital Marketing, Media and promotion plan, Blogs, Websites, Portal and Their Differences, Visibility, Visitor Engagement, Conversion Process, Retention, Performance Evaluation, Online Reputation Management	**8**
Unit-2	**Search Engine Optimization (SEO):** Optimization, Definition, its importance, Strategies and techniques used to optimize any article/page/website/blog for traffic generation and revenue, different On page Optimization Techniques, different Off Page Optimization Techniques, Preparing Reports, Creating Search Campaigns, and Creating Display Campaigns. **Social Media Optimization (SMO):** Introduction to Social media, Types of Social Media platforms (Facebook, Twitter, Instagram, YouTube), Roles of Social Media in Marketing, Goals and Strategies, Facebook Marketing, Email Marketing, Google plus marketing , Word press Blog Creation, Twitter Marketing, Linkedln Marketing, Pinterest, Instagram Marketing, eCommerce Marketing, Affiliate Marketing, SMS Marketing, mage Optimization, social media Analytical Tools.	**16**
Unit-3	**Search Engine Marketing:** Introduction and Use of Search Engine Marketing, Introduction to Online Advertising and Ad words, Tools used — Pay Per Click, Google Adwords, Display Advertising Techniques, Advertisement Designing, Adwords Account And Campaign Basics, Adwords Targeting And Placement, Adwords Bidding And Budgeting, Adwords Tools, Opportunities, Optimizing Performance, Ads Type, Bidding Strategies, Search Network, Display Network, Shopping Ads, Video Ads, Universal App Ads, Tracking Script, Remarketing, Performance Monitoring, Report Generation. **Website Traffic Analysis:** Web Analytics Tools, Google Analytics, Navigating Google Analytics, Traffic Sources, Acquisition, Behavior, Content, Visitors, Live Data, Demographics	**16**

Books Recommended:

1) Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited.
2) The Beginner's Guide to Digital Marketing (2015). Digital Marketer. Pulizzi,J.(2014) Epic Content Marketing, Mcgraw Hill Education.
3) Lorrie Thomas. The McGraw-Hill 36-Hour Course: Online Marketing, McGraw Hill.

BCA (Science)-II Semester- III

Course Code: # DSC 3D /GE-3D **Course Title: Python-II**
Total Contact Hours: Hrs. **Total Marks: 50 (40 Lectures)**
Teaching Scheme: Theory 6 Lect./Week **Total Credits: 02**

Unit No	Content	No. of Lectures
Unit-1	**Functions:** Difference between a Function and a Method, Defining a function, Calling a function, Advantages of functions, Types of functions, Function parameters:-Formal parameters, Actual parameters, Anonymous functions, Global and Local variables, **Modules:** Importing module, Creating & exploring modules, Math module, Random module, Time module, Numpy, Scipy **Object Oriented Programming:** Features, Concept of Class & Objects, Constructor, Types of Variables, Namespaces, Types of Methods, Inner Classes, Constructors in Inheritance, Overriding Super Class Constructors and Methods, Types of Inheritance, Abstract Classes and Interfaces, The Super() Method, Operator Overloading, Method Overloading, Method Overriding.	**16**
Unit-2	**Threads:** Introduction, uses, types, creating threads, thread class methods and synchronization **Exception Handling:** Errors in a Program, Exceptions, Exception handling, Types of Exceptions, User-defined Exceptions **Python File Operation:** Types of File, Opening and Closing a File, Reading and writing to files, Manipulating directories	**12**
Unit-3	**Graphical user interface-** root window, fonts and colors, working with containers, canvas, frame, widgets and its types. **Database connectivity**-Installing MySQLdb module, working with MySQL, Retrieving, inserting, Deleting and Updating rows into table, creating database tables	**12**

Books Recommended:

1. Python Cookbook: Recipes for Mastering Python 3 by Brian Kenneth Jones and David M. Beazley-O'Reilly Media
2. Beginning Python by Magnus Lie Hetland-Apress

Lab Course on Data Structure I and II

Array

1) Write a program to implement array with following operations:
    a) Insert Element
    b) Delete element from entered position
    c) Traverse array element.
    d) Count
    e) Search element
2) Write a programs that prints array elements in reverse order.
3) Write a program that finds only even elements in an array.
4) Write a program that finds only odd elements in an array.
5) Write a program that finds addition of matrices.
6) Write a program that finds multiplication of matrices.

Stack

1) Write a program to implement stack by using array. (Static Implementation of stack)
2) Write a program, which reverses the string by using stack.
3) Write a program to check entered string is palindrome or not by using stack.
4) Write a program to convert decimal number into binary number by using stack.
5) Write a program to count total number of vowels present in string by using stack.
6) Write a program which convert infix expression into prefix expression.
7) Write a program which convert infix expression into Postfix expression.
8) Write a program which check entered expression is valid or not.
9) Write a program for evaluation of postfix expression.
10) Write a program to calculate factorial of entered number by using recursion.
11) Write a program to calculate digit sum of entered number by using recursion.
12) Write a program to find face value of entered number by using recursion.

Queue

1) Write a program to implement linear queue by using array. (Static Implementation of queue)
2) Write a program to implement Circular queue.
3) Write a program to implement Priority queue.
4) Write a program to implement IRD (Input Restricted Deque)
5) Write a program to implement ORD (Output Restricted Deque)

Linked List

1) Write a program to implement singly linear linked list with its basic operations.
2) Write a program to implement stack by using linked list. (Dynamic implementation)
3) Write a program to implement queue by using linked list. (Dynamic implementation)
4) Write a program to implement doubly linear linked list with its basic operations.
5) Write a program to implement singly circular linked list with its basic operations.
6) Write a program to implement doubly circular linked list with its basic operations.

Tree

1) Write a program to implement binary search tree with tree traversal methods.
2) Write a program to implement BST with following operations:
    I) Insert Node
    II) Count Leaf nodes
    III) Count Non-Leaf nodes
    IV) Count Total nodes
3) Write a program to implement BST with following operations:
    I) Insert Node II) Find Maximum node
    III) Find Minimum Node IV) Search node
    V) Display only odd nodes VI) Display only even nodes
    VII) Display leaf nodes VIII) Find level of node
    IX) Find degree of node X) Delete Node

Graph

1) Write a program to represent undirected and directed graph by using Adjacency matrix.
2) Write a program to represent weighted graph by using Adjacency matrix.
3) Write a program to implement graph by using linked list and perform following operations:
    1) Insert Vertex (Node)
    2) Display Vertices
    3) Search Vertex
    4) Insert Edge
    5) Find adjacent vertices
    6) Display Graph
4) Write a program to implement breadth first search (BFS) traversal of graph.
5) Write a program to implement depth first search (DFS) traversal of graph.

Sorting and Searching

1) Write a program to implement simple exchange sort method.
2) Write a program to implement bubble sort method.
3) Write a program to implement insertion sort method.
4) Write a program to implement selection sort method.
5) Write a program to implement Shell sort method.
6) Write a program to implement linear searching technique for unsorted data.
7) Write a program to implement linear searching technique for sorted data.
8) Write a program to implement Binary search technique.

Lab Course on Software Testing:

1) Design test case **for Internet Banking Application**
2) Design test case for Gmail Login Functionality
3) Design test case **for college admission Application**
4) Design test case for online order processing.
5) Design test case for social networking sites.
6) Design test case for MS-word application
7) Design test case for simple calculator
8) Design test case for ball pen.
9) Design test case for Paint application.
10) Design test case for Online Flight Booking

Lab Course on DBMS using Oracle:

1. Create the following Databases.

Salesmen

SNUM	SNAME	CITY	COMMISSION
1001	Prashnat	Mumbai	12
1002	Rajesh	Surat	13
1004	Anandi	Mumbai	11
1007	Priya	Delhi	15
1003	Suchita	Pune	10
1005	Nayan	Baroda	14

Customers

CNUM	CNAME	CITY	RATING	SNUM
2001	Harsh	Baroda	100	1001
2002	Gita	Pune	200	1003
2003	Lalit	Mumbai	200	1002
2004	Govind	Delhi	300	1002
2006	Chirag	Surat	100	1001
2008	Prajkta	Delhi	300	1007
2007	Sushma	Mumbai	100	1004

Orders

ONUM	AMOUNT	ODATE	CNUM	SNUM
3001	18	10/3/2019	2008	1007
3003	767	15/3/2019	2001	1001
3002	1900	10/3/2019	2007	1004
3005	5160	20/4/2019	2003	1002
3006	1098	20/4/2019	2008	1007
3007	1713	10/5/2019	2002	1003
3008	75	10/5/2019	2004	1002

3010	4723	15/6/2019	2006	1001
3011	1309	18/3/2019	2004	1002

Solve the following queries using above databases and where clause range searching and pattern matching.

1. Produce the order no, amount and date of all orders.
2. Give all the information about all the customers with salesman number 1001.
3. Display the following information in the order of city, sname, snumand commission.
4. List of rating followed by the name of each customer in Surat.
5. List of snum of all salesmen with orders in order table without any duplicates.

Solve the following queries using above databases and group by clause.

1. Find out the largest orders of salesman 1002 and 1007.
2. Count all orders of October 3, 1997.
3. Calculate the total amount ordered.
4. Calculate the average amount ordered.
5. Count the no. of salesmen currently having orders.

Solve the following queries using above databases and formatted output and order by clause.

1. List all salesmen with their % of commission.
2. Display the no. of orders for each day in the descending order of the no. of orders in the following format.
   FOR dd-mon-yy, there are __ Orders.
3. Assume each salesperson has a 12% commission. Write a query on the order table that will produce the order number, salesman no and the amount of commission for that order.
4. Find the highest rating in each city in the form :
   For the city (city), the highest rating is : (rating)
5. List all in descending order of rating.
6. Calculate the total of orders for each day and place the result in descending order.

Solve the following queries using above databases and join.

1. Show the name of all customers with their salesman's name.
2. List all customers and salesmen who shared a same city.
3. List all orders with the names of their customer and salesman.
4. List all orders by the customers not located in the same city as their salesman.
5. List all customers serviced by salespeople with commission above 12%.

Solve the following queries using above databases and join and subquery.

1. Find all orders attributed to salesmen in 'London'.
2. List the commission of all salesmen serving customers in 'London'.
3. Find all customers whose cnum is 1000 above than the snum of Sejal.
4. Count the no. of customers with the rating above than the average of'Surat'.
5. List all orders of the customer 'Chirag'.

Solve the following queries using above databases and delete and update.

1. Remove all orders from customer Chirag from the orders table.
2. set the ratings of all the customers of Piyush to 400.
3. Increase the rating of all customers in Rome by 100.
4. Salesman Sejal has left the company. Assign her customers to Miti.
5. Salesman Miti has resigned. Reassign her number to a new salesman Gopal whose city is Bombay and commission is 10%.

Solve the following queries using above databases and alter table and table constraints..

1. How the onum field is forced to be an unquie?
2. Create an index to permit each salesman to find out his orders by date quickly.
3. Write a command to enforce that each salesman is to have only one customer of a given rating.
4. Write a command to add the item-name column to the order table.
5. Write a command to create the salesmen table so that the default commission is 10% with no NULLs permitted, snum is the primary key and all names contain alphabeticals only.
6. Give the commands to create our sample tables (salesmen, customer,orders) with all the necessary constraints like PRIMARY KEY, NOT NULL , UNIQUE, FOREIGN KEY.

Solve the following queries using above databases and view.
1. Create a view called Big orders which stores all orders larger than Rs. 4000.
2. Create a view Rate count that gives the count of no. of customers a teach rating.
3. Create a view that shows all the customers who have the highest ratings.
4. Create a view that shows all the number of salesmen in each city.
5. Create a view that shows the average and total orders for each salesmen after his name and number.
6. Create a cursor emp_cur,fetch record from emp table and check whether sal>10000 then update Grade = 'A' else if sal = > 5000 and sal<= 10000 then update Grade = 'B'
7. Write a procedure to find the table structure of a given number
8. Write a procedure on software table to calculate selling cost of all software of a specified person

Lab Course on Core Java:

1. WAP to demonstrate the use of various data types.
2. WAP which will check number for Armstrong, prime, palindrome & perfect number.
3. WAP USING arrays to sort player name along with timing of Athlete (sort using two dimensional array).
4. WAP to demonstrate the use of Access Control.(Public, private , protected).
5. WAP using static & non static data members.
6. WAP using Interface.
7. WAP to demonstrate use of Exception Handling.
8. WAP which will create user defined Exception.
9. WAP which will accept string and calculate how many vowels present in it.
10. WAP to implement any two collection classes.
11. WAP to implement InetAdress Class.
12. WAP Event classes and Listener interfaces.
13. WAP which will create following threads.
    a. Print even & odd numbers.
    b. Print Hello 15 times.
    c. Print the prime number.
14. WAP which will demonstrate overloading & Inheritance.
15. WAP to show demo of parameterized constructor.
17. WAP to append the contents of one file with another file.
18. WAP to develop a calculator using Applet (functions showing addition, subtraction, Multiplication and Division.
19. WAP which will insert student records into database having fields roll no, name, marks of five subjects, total marks and percentage and display the same.
20.WAP to implement GridLayout, CardLayout.

Lab Course on Web Technology using PHP
1) Write PHP code to check entered number is Armstrong or Not.
2) Write a menu driven program to perform following operations:
a) Check Number is Palindrome or not.
b) Check Number is Perfect or not.
c) Find face value of Entered number.
d) Check Number is Prime or not.
e) Check Number is Strong or not.
3) Write a PHP code to perform following operations:
a) Sort array element
b) Find Maximum and Minimum number in array
c) Merge two arrays in third array.
d) Swap two array elements
4) Write a program to overload the constructor.
5) Write a program which uses the static methods and static variables.
6) Write a program to implement different types of inheritance.
7) Write a program to implement interface.

8) Write a program to handle different types of exceptions.
9) Write a program which shows the use of ‘final’ keyword.
10) Write a program to copy the content of one file into another.
11) Write a program to merge two files into third file.
12) Design a web application to perform following task on employee table.
I) Add New II) Save III) Delete IV) Update V) Move First VI) Move Last
13) Design a web application that uses cookies and session object.