

**Punyashlok Ahilyadevi Holkar Solapur University**  
**Faculty of Science and Technology**  
**Choice Based Credit System (CBCS), (w.e.f.2020-21)**  
**Structure for B. C. A. – Part II (Science)**

Subject/ Core Course	Name and Type of the Section		No. of Papers/ Practical	Hrs/week			Total Marks Per Section	UA	CA	Credits
	Type	Name		L	T	P				
<b>Class :</b>	<b>B.C. A.- II Semester – III</b>									
<b>Core</b>	DSC1C	OOPS with C++-I	Section -I	03	--	--	50	40	10	4.0
		Data structures using 'C'- I	Section-II	03	--	--	50	40	10	
	DSC2C	Database Management System	Section-I	03	--	--	50	40	10	4.0
		Software Testing & Quality Assurance	Section-II	03	--	--	50	40	10	
	DSC3C	Web Development using PHP	Section-I	03	--	--	50	40	10	4.0
		Computer Networks-I	Section-II	03	--	--	50	40	10	
	SEC-I	Financial Accounting with Tally		06	--	--	100	80	20	4.0
<b>Total</b>				<b>24</b>	--	--	<b>400</b>	<b>320</b>	<b>80</b>	<b>16</b>
<b>Class :</b>	<b>B. C. A. - II Semester - IV</b>									
<b>Core</b>	DSC1D	OOPS with C++-II	Section -I	03	--	--	50	40	10	4.0
		Data structures using 'C'- II	Section-II	03	--	--	50	40	10	
	DSC2D	MySQL	Section-I	03	--	--	50	40	10	4.0
		Ethics and Cyber law	Section-II	03	--	--	50	40	10	
	DSC3D	Angular JS	Section-I	03	--	--	50	40	10	4.0
		Advanced Computer Networks	Section-II	03	--	--	50	40	10	
	AECC	Environmental Studies		03	--	--	50	40	10	NC
SEC-II	Python Programming		06	--	--	100	80	20	4.0	
<b>Total (Theory)</b>				<b>27</b>	--	--	<b>450</b>	<b>360</b>	<b>90</b>	<b>16</b>
<b>Core</b>	DSC 1 C & 1 D		Practical I & II	--	--	8	100	80	20	4.0
	DSC 2 C & 2 D		Practical I & II	--	--	8	100	80	20	4.0
	DSC 3 C & 3 D		Practical I & II	--	--	8	100	80	20	4.0
<b>Total (Practical)</b>						<b>24</b>	<b>300</b>	<b>240</b>	<b>60</b>	<b>12</b>
<b>Grand Total</b>				<b>51</b>	--	<b>24</b>	<b>1150</b>	<b>920</b>	<b>230</b>	<b>44</b>

\*Core Subjects: Chemistry/Physics/Electronics/Computer

Science/Mathematics/Statistics/Botany/Zoology/ Microbiology/Geology/ Geography/Psychology

**Abbreviations:** L: Lectures, T: Tutorials, P: Practical's, UA:University Assessment, CA: College Assessment, DSC / CC: Core Course, AEC : Ability Enhancement Course, DSE : Discipline Specific Elective Section, SEC : Skill Enhancement Course, GE : Generic Elective, CA: Continuous Assessment, ESE: End Semester Examination

**BCA (Science)-II Semester- III****Course Code: DSC1C (Section-I)****Total Contact Hours: Hrs.****Teaching Scheme: Theory 3 Lect./Week****Course Title: OOP'S with C++-I****Total Marks: 50(40Lectures)****Total Credits: 02**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<p><b>Introduction to (Object Oriented Programming)OOP:</b></p> <ul style="list-style-type: none"> <li>• Introduction to OOP, Features of OOP's- Class, Object, Data Abstraction and encapsulation, Data hiding, Message passing, polymorphism, inheritance, persistency, delegation, extensibility</li> <li>• Comparison between POP(Procedural Oriented Programming) and OOP, Advantages of OOP's, Application of OOP</li> </ul>	<b>08</b>
<b>Unit-2</b>	<p><b>Introduction to C++:</b></p> <ul style="list-style-type: none"> <li>• History of C++, C++ basics(C++ tokens)- Keywords, identifiers, data types, constants, operators, special symbols, control flow statements</li> <li>• Types of Variables- Value, pointer and reference.</li> <li>• Structure of C++ program, Introduction to cin and cout objects</li> <li>• Function and its types, template, Default argument, Parameter passing methods, inline function</li> <li>• Static polymorphism(Function overloading)</li> </ul>	<b>12</b>
<b>Unit-3</b>	<p><b>Classes and Objects:</b></p> <ul style="list-style-type: none"> <li>• Introduction to class and object.</li> <li>• Defining class (class specification), Creating object</li> <li>• Access specifier(Visibility modes)-public, protected, private</li> <li>• Class members- data members, member &amp; Non-member function</li> <li>• Defining member function inside and outside the class</li> <li>• Static data members and static member functions</li> <li>• Pointer to object, Array of object, Returning objects from functions</li> <li>• Passing object as parameter by value, by pointer, by reference</li> <li>• Dynamic memory allocation (new, delete)</li> <li>• Friend function and friend class, nesting of classes.</li> <li>• Constructors Concept, characteristics of constructor</li> <li>• Types of constructor- default, parameterized and copy</li> <li>• Constructor overloading, Constructor with default argument</li> <li>• Destructor Concept, characteristics of destructor.</li> <li>• Static polymorphism (Operator overloading) Concept- rules to overload operator, unary and binary operator overloading, overloading operator using member function and friend function.</li> <li>• Type conversion (type casting)- implicit and explicit.</li> </ul>	<b>20</b>

**Books Recommended:**

- 1) OOP in C++ – E-balagurusamy
- 2) Mastering C++-K. R. Venugopal
- 3) The Complete Reference C++-Herbert Schildt

**BCA (Science)-II Semester- III****Course Code: DSC1C (Section-II)****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**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<b>An Introduction to Data Structures:</b> 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.	<b>8</b>
<b>Unit-2</b>	<b>Array:</b> Introduction to Array, types of array- one dimensional, two dimensional, multidimensional, Operations of array- insert, delete, traverse, count, display, reverse	<b>4</b>
<b>Unit-3</b>	<b>Stack:</b> 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.	<b>8</b>
<b>Unit-4</b>	<b>Queue:</b> 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	<b>8</b>
<b>Unit-5</b>	<b>Linked Lists:</b> Introduction to Linked Lists, Difference between Array and linked list. Types of linked list- 1) Linear linked list- Singly (Single) and Doubly (Double) 2) Circular linked list- Singly (Single) and Doubly (Double) 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 (Dynamic stack), Implementation of queue using linked list (Dynamic queue)	<b>12</b>

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

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<b>Introduction to Database Management System:</b> <ul style="list-style-type: none"> <li>• Definition, Limitations of traditional file system</li> <li>• Advantages of DBMS, Components of DBMS, Database Users</li> <li>• Database Structure</li> <li>• Database Architecture- 2-tier and 3 level tier architecture</li> <li>• Instances and Schemas-3 Schema architecture</li> <li>• Database languages, Data Independence, Data Abstraction</li> </ul>	<b>06</b>
<b>Unit-2</b>	<b>Database Design</b> <ul style="list-style-type: none"> <li>• Types of data models- Relational, Network, Hierarchical</li> <li>• E-R model: entities, attributes and its types, Relationship, Relationship sets, Generalization, Specialization, Aggregation, ER-to-Relational Mapping</li> <li>• Relational Model: Relation, Domain, Tuples, Degree, cardinality</li> <li>• Relational Algebra operations: Select, Project, Cartesian Product, Union, Set difference, join</li> </ul>	<b>06</b>
<b>Unit-3</b>	<b>Transaction Management &amp; Concurrency Control:</b> <ul style="list-style-type: none"> <li>• Introduction of Transaction, ACID properties, transaction states, scheduling and types, conflict and view serializability.</li> <li>• Introduction of Concurrency Control, problems of concurrency control, lock based protocols, timestamp based protocol, deadlock, deadlock handling methods.</li> </ul>	<b>14</b>
<b>Unit-4</b>	<b>Database recovery and Atomicity:</b> <ul style="list-style-type: none"> <li>• Introduction, Failure Classification, recovery algorithms, Undo/Redo operations, Log file, log base recovery, shadow paging, recovery with concurrent transaction, checkpoints/syncpoints/ savepoints.</li> <li>• Distributed Databases: Structure of Distributed Database, Advantages and Disadvantages of Data Distribution, Data Replication, Data Fragmentation</li> </ul>	<b>14</b>

**Books Recommended:**

- 1) Database System Concepts by Korth Silberschetz
- 2) Fundamentals of Database Systems by Elmsari, Navathe
- 3) SQL, PL/SQL The programming language of Oracle by Ivan Bayross
- 4) "Introduction to Database Systems", C.J.Date, Pearson Education.

**BCA (Science)-II Semester- III****Course Code: DSC2C (Section-II) Course Title: Software Testing & Quality Assurance****Total Contact Hours: Hrs.****Total Marks: 50(40 Lectures)****Teaching Scheme: Theory 3 Lect./Week****Total Credits: 02**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<p><b>Introduction To Software Testing:</b></p> <ul style="list-style-type: none"> <li>• What is Software Testing, Importance or need of software testing</li> <li>• Differences between Manual and Automation Testing</li> </ul> <p><b>White Box Testing (WBT):</b></p> <ul style="list-style-type: none"> <li>▪ Introduction to WBT, Advantages &amp; Disadvantages of WBT.</li> <li>▪ Static Techniques: Informal Reviews, Walkthroughs, Technical Reviews, Inspection</li> <li>▪ Dynamic Techniques or Structural Techniques: Statement Coverage Testing, Branch Coverage Testing, Path Coverage Testing, Conditional Coverage Testing, Loop Coverage Testing</li> </ul>	<b>08</b>
<b>Unit-2</b>	<p><b>Black Box Testing(BBT):</b></p> <ul style="list-style-type: none"> <li>• Introduction to BBT, Advantages and Disadvantages of BBT</li> <li>• Black Box Techniques: Boundary Value Analysis, Equivalence Class Partition, State Transition, Cause Effective Graph, Decision Table, Use Case Testing</li> <li>• Experienced Based Techniques: Error guessing, Exploratory testing</li> </ul> <p><b>Levels of Testing</b></p> <ul style="list-style-type: none"> <li>• Functional Testing: System Testing, Smoke Testing, <ul style="list-style-type: none"> <li>▪ Integration Testing &amp; types-Top-Down, Bottom-Up, Non-Incremental</li> <li>▪ Acceptance Testing-Alpha and Beta</li> <li>▪ Regression Testing and types- Unit/Retest, Regional, Full</li> </ul> </li> <li>• Non Functional Testing: Adhoc Testing, Recovery Testing <ul style="list-style-type: none"> <li>▪ Performance Testing and types: Load Testing, Stress Testing, Volume Testing, Soak Testing</li> </ul> </li> </ul>	<b>15</b>
<b>Unit-3</b>	<p><b>Test cases design Techniques:</b></p> <ul style="list-style-type: none"> <li>• Introduction Test Case, Types of Test Cases, Test Case Template</li> <li>• How to write a test case with examples, Preparing Review Report</li> </ul> <p><b>Software Test Life cycle</b></p> <ul style="list-style-type: none"> <li>▪ Writing Test Plan, Preparing Traceability Matrix</li> <li>▪ Writing Test Execution Report and Summary Report</li> </ul>	<b>10</b>
<b>Unit-4</b>	<p><b>Bug/Defect Life Cycle:</b> Difference between Bug, Defect, Failure, Error</p> <ul style="list-style-type: none"> <li>▪ Defect Tracking and Reporting</li> <li>▪ Types of Bugs, Identifying the Bugs, Reporting the Bugs</li> </ul> <p><b>Case study:</b> Design test case for login page, Online Purchase Order</p>	<b>07</b>

**Books Recommended:**

- 1) The art of Software Testing– Glenford J. Myers
- 2) Lessons learned in Software Testing – CemKaner, James Bach, Bret Pettichord
- 3) A Practitioner’s Guide to Software Test Design- Lee Copeland
- 4) Software Testing Techniques, 2nd edition- Boris Beizer
- 5) How to Break Software: A Practical Guide to Testing- James Whittaker

**BCA (Science)-II Semester- III****Course Code: DSC3C (Section-I)****Course Title: Web Development using PHP****Total Contact Hours: Hrs.****Total Marks: 50(40 Lectures)****Teaching Scheme: Theory 3 Lect./Week****Total Credits: 02**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<p><b>Introduction to Web Development:</b></p> <ul style="list-style-type: none"> <li>• Introduction to web applications, Client Side Vs Server Side Scripting</li> <li>• WebServers: Local Servers and Remote Servers, Installing Web servers, Internet Information Server(IIS),Personal Web Server(PWS)</li> <li>• Static website vs Dynamic website development.</li> <li>• Introduction to PHP Framework, Basic PHP syntax,</li> <li>• Data types in PHP, Variables, Constants, operators and Expressions, printing data on PHP page,</li> <li>• Control statements–if, switch case, for, while, do while.</li> <li>• Arrays: Initialization of an array, Iterating through an array, Sorting arrays, Array Functions,</li> <li>• Functions: Defining and Calling Functions, Passing by Value and passing by references, Inbuilt Functions.</li> </ul>	<b>10</b>
<b>Unit-2</b>	<p><b>String and Working with Forms</b></p> <ul style="list-style-type: none"> <li>• String: Formatting String for Presentation and Storage, Joining and Splitting String, Comparing String, Matching and replace Substring, patterns, basic regular expressions.</li> <li>• 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 (Java script)</li> </ul>	<b>14</b>
<b>Unit-3</b>	<p><b>Working with Database MySQL:</b></p> <p>History of MySQL, Installation and Up gradation to MYSQL, MySQL Architecture, MySQL Server Start and Stop, Working with PHP-MYSQL Environment, Connecting to the MYSQL, Selecting a database, Creating Tables, Inserting, deleting and updating data in to table, Displaying returned data on Web pages, Finding the number of rows, Executing multiple queries, Checking data errors.</p>	<b>10</b>
<b>Unit-4</b>	<p><b>State Management:</b></p> <ul style="list-style-type: none"> <li>• Cookies: Setting time in a cookie with PHP, Deleting a cookie, Creating session cookie, Working with the query string</li> <li>• Session: Starting a session, Registering Session variables, working with session variables, destroying session, passing session Ids, encoding and decoding session variables</li> </ul>	<b>6</b>

**Books Recommended:**

- 1) PHP: The Complete Reference-Steven Holzner.
- 2) Professional PHP 5-Ed Lecky-Thompson,HeowEide-Goodman, Steven D. Nowicki
- 3) Programming PHP- Rasmuslerdorf, Kevin Tatroe.
- 4) Learning php, mysql, javascript and css –Oreilly- Robin Nixon

**BCA (Science)-II Semester- III****Course Code: DSC3C (Section-II)****Course Title: Computer Networks****Total Contact Hours: Hrs.****Total Marks: 50(40 Lectures)****Teaching Scheme: Theory 3 Lect./Week****Total Credits: 02****Course Objective:**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<b>Introduction to Data Communication &amp; Networking:</b> Data Communication: Components, Data Representation, Data Flow Communication Model Computer N/W: Introduction of Network, Uses of computer network N/W Components: Hubs, Switches, Repeaters, Bridges, Routers, Gateways. N/W Topologies, Types of Networks, Inter-networking, Applications of Internet	<b>06</b>
<b>Unit-2</b>	<b>Network Models:</b> Protocols & Standards, Protocol Hierarchies, Design Issues of Layers, Services Primitives, Connection oriented and connection less services Reference Model: ISO-OSI reference model, TCP/IP reference model.	<b>06</b>
<b>Unit-3</b>	<b>Physical layer:</b> Signals-Analog & Digital Signals, Period, Frequency, Phase, Amplitude, Bandwidth, Bit Rate, Bit Length, Fourier analysis. Transmission Impairment-Attenuation, Distortion, Noise, Transmission Media-Guided Media-Magnetic Media, Twisted Pair, Coaxial Cable, Fiber Optic Cable, Unguided Media- Wireless Radio Waves, Microwaves, Infrared, Satellite Communication Analog Transmission-Modem, Digital Transmission-Pulse Code Modulation, Manchester & Differential Manchester Coding. Modulation and types- Amplitude, Frequency, Phase Transmission Mode-Parallel, Serial, Synchronous Transmission, Asynchronous Transmission. Multiplexing and types- Frequency, Time, Wavelength, Switching and types- Circuit, Message, Packet	<b>16</b>
<b>Unit-4</b>	<b>Data link layer:</b> Data link layer Design issues, Error Detection & Correction- Types of Errors, Hamming Distance, Error Detection-Parity Check, Cyclic Redundancy Check, Checksum Check Error correction, Data Link Control-Framing, Flow & Error Control, Protocols-Simplex, Stop and Wait, Stop and Wait ARQ, Go Back N ARQ, Selective repeat ARQ. Multiple Access Protocol-ALOHA, CSMA, CSMA/CD, CSMA/CA Channelization, FDMA, TDMA, CDMA	<b>12</b>

**Reference Books:**

1. Computer Networking by Tannenbaum.
2. Data communication and networking by B A Forouzan

**BCA (Science)-II Semester- III****Course Code: SEC-I****Course Title: Financial Accounting with Tally****Total Contact Hours: Hrs.****Total Marks: 100(80 Lectures)****Teaching Scheme: Theory 6 Lect./Week****Total Credits: 04****Course Objective:** To impart basic knowledge of Management Accounting.

Unit No	Content	No. of Lectures
Unit-1	<p><b>Introduction to Book-keeping and Accountancy-</b> 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</p> <p><b>Fundamentals of Double Entry Book-keeping-</b> 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</p>	16
Unit-2	<p><b>Journal-</b> Importance and Utility of Accounting Documents, Definition, Importance and Utility of Journal, Specimen of Journal, Recording of Journal entries with GST.</p> <p><b>Ledger-</b> 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</p> <p><b>Subsidiary-Books-</b>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</p>	16
Unit-3	<p><b>Bank Reconciliation Statement-</b> Introduction and Utilities of Accounting Documents, Need and Importance, Introduction of Bank Reconciliation Statement, Reasons for difference between Cash Book balance and Pass Book balance, Specimen of Bank Reconciliation Statement.</p> <p><b>Depreciation-</b> Introduction and Importance of Depreciation, Factors of Depreciation, Methods of Depreciation, Accounting Treatment for Depreciation.</p> <p><b>Rectification of Errors-</b>Introduction and Effects of errors, Types of Errors, Detection &amp; Rectification of errors, Preparation of Suspense Accounts</p>	16
Unit-4	<p><b>Final Accounts of a Proprietary concern-</b> Introduction, Objectives and Importance of Final Accounts, Preparation of Trading Account. Preparation of Profit and Loss Account, Preparation of Balance Sheet. Effects of following adjustments.</p> <ul style="list-style-type: none"> <li>▪ 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</li> </ul> <p><b>Introduction to Tax Deducted at Source (TDS)-</b>TDS in Tally, TDS Masters, Vouchers / Transactions, Advance to a Party, TDS Reports, TDS Return, TDS E-Return, TDS Outstanding, GST Basics.</p>	16



<b>Unit-5</b>	<p><b>Implementation through Tally</b></p> <ol style="list-style-type: none"> <li>1. Create, Alter &amp; Display Stock Groups and Stock Items,</li> <li>2. All inventory voucher types and transactions Inventory details in accounting vouchers.</li> <li>3. Reports like Stock summary, Inventory books like Stock item, Group summary, Stock transfers, Physical stock register, Movement analysis, Stock group &amp; item analysis, stock category analysis Ageing analysis, Salesorder &amp; Purchase order book, Statement of inventory related to Godowns, categories, stock query, Reorder status, Purchase &amp; Sales order summary, Purchase &amp; Sales bill pending, Exception reports like negative stock&amp; ledger, overdue receivables &amp; payables, memorandum vouchers, optional vouchers, post-dated vouchers, reversing journal</li> </ol>	<b>16</b>
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**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 (Science)-II Semester- IV****Course Code: DSC1D (Section-I)****Total Contact Hours: Hrs.****Teaching Scheme: Theory 3 Lect./Week****Course Title: OOPS with C++-II****Total Marks: 50(40 Lectures)****Total Credits: 02**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<p><b>Inheritance and Runtime Polymorphism:</b></p> <ul style="list-style-type: none"> <li>• Introduction of inheritance, benefits,use</li> <li>• Defining derived class</li> <li>• Types of derivations</li> <li>• Types(Forms) of Inheritance- Single, Multi-level, Multiple, Hierarchical, Hybrid, Multi-path (Virtual base class)</li> <li>• Behavior of constructors and destructor in inheritance</li> <li>• Overloaded member functions</li> <li>• Pointer to base class, Pointer to derived class</li> <li>• Object composition-delegation</li> </ul> <p><b>Runtime polymorphism-</b></p> <ul style="list-style-type: none"> <li>• Introduction of runtime polymorphism</li> <li>• Virtual functions- Concept, characteristics and use of virtual function.</li> <li>• Pure virtual function-Concept, characteristics and Use.</li> <li>• Abstract class, virtual destructors</li> </ul>	<b>15</b>
<b>Unit-2</b>	<p><b>Stream and Files:</b></p> <ul style="list-style-type: none"> <li>• Introduction to streams in C++</li> <li>• Stream classes and File stream classes</li> <li>• Formatted and unformatted I/O functions and Manipulators.</li> <li>• File Manipulations- Opening, closing, reading, writing, Appending</li> <li>• File opening modes-Opening files, using open() and constructor</li> <li>• Error handling during file manipulations</li> <li>• Command line arguments.</li> </ul>	<b>15</b>
<b>Unit-3</b>	<p><b>Exception Handling and Template:</b></p> <ul style="list-style-type: none"> <li>• Introduction to Exception handling</li> <li>• Exception handling mechanism-try, catch, throw keywords.</li> <li>• Custom exception.</li> <li>• Introduction to function template- overloaded function and user defined template</li> <li>• class template- inheritance of class template, overloaded operators and class template containership</li> </ul>	<b>10</b>

**Books Recommended:**

- 1) OOP in C++ – E-balagurusamy
- 2) Mastering C++ - K.R. Venugopal
- 3) Structured approach using C++ – Behrouz A. Forouzan
- 4) The Complete ReferenceC++- Fourth Edition. Herbert Schildt

**BCA (Science)-II Semester- IV****Course Code: DSC1D (Section-II)****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**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<p><b>Trees:</b> 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</p> <p>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</p>	<b>10</b>
<b>Unit-2</b>	<p><b>Graph:</b> Concept &amp; terminologies used in graph, Graph Representation using- Array and linked list, Graph traversals – BFS &amp; DFS, Dijkstra's shortest path algorithm, and application of graph.</p>	<b>10</b>
<b>Unit-3</b>	<p><b>Sorting:</b> 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</p>	<b>10</b>
<b>Unit-4</b>	<p><b>Searching:</b> Introduction and definition of Searching, Types of searching-Linear (Sequential) Search, Binary Search, Indexed sequential search, Hashing and different Hash functions.</p>	<b>10</b>

**Reference Books**

1. Aho, Hopcroft, Ulman: Data structures and Algorithms.
2. Niklaus Wirth: Algorithms, data structures, Programs.
3. ThomsHorbron: File Systems, Structures and Algorithms (PHI).
4. D. E. Kunth: Art of computer Programming Vol – I.
5. Tanenbaum: Data structures using C and C++ (PHI).
6. fundamentals of computer algorithms by ellis horowitz sartaj sahni 2nd edition galgotia publication

**BCA (Science)-II Semester- IV****Course Code: DSC2D (Section-I)****Total Contact Hours: Hrs.****Teaching Scheme: Theory 3 Lect./Week****Course Title: Relational Database MySQL****Total Marks: 50(40 Lectures)****Total Credits: 02**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<b>Introduction to MySQL</b> <ul style="list-style-type: none"> <li>▪ Installing and starting MySQL instance, History and Architecture of MySQL</li> <li>▪ Components of MySQL -DML,DDL,DCL,DQL</li> <li>▪ Data types in MySQL-Numeric, String, Complex, Date and Time,</li> <li>▪ Creating databases and show databases</li> </ul>	<b>4</b>
<b>Unit-2</b>	<b>MySQL Operators, Function and clauses</b> <ul style="list-style-type: none"> <li>▪ MySQL operators- Arithmetic, Comparison, Logical, Bit, like</li> <li>▪ MySQL Functions- Aggregate, Math, String, Date and Time, control flow functions and expressions, Type conversion, Formatting, Encryption</li> <li>▪ MySQL clause-where, distinct, order by, group by, having, rollup.</li> </ul>	<b>8</b>
<b>Unit-3</b>	<b>Performing Operation on Table Data</b> <ul style="list-style-type: none"> <li>▪ Populating tables with data, Retrieving data from tables, Sorting data in a table, Deleting data from table, Updating data in tables, searching data</li> <li>▪ Adding and Dropping columns, Modifying and Rename existing columns</li> <li>▪ Renaming table using alter table, Changing a table type</li> <li>▪ Finding out the tables created by user, Displaying a table structure</li> <li>▪ Creating a table from a table, Inserting data into a table from another table</li> </ul>	<b>8</b>
<b>Unit-4</b>	<b>MySQL constraints, Join and View</b> <ul style="list-style-type: none"> <li>▪ Applying data constraints- column level and table level</li> <li>▪ Types of Data constraints- <ul style="list-style-type: none"> <li>• I/O constraints- Not null, Unique, Primary key, Foreign key,composite</li> <li>• Business rule constraints- Check,</li> </ul> </li> <li>▪ Adding, Modify and drop constraints using alter table command</li> <li>▪ MySQL join:- Advantages &amp; disadvantages of Join, Types of Joins</li> <li>▪ MySQL View:- why view, Create, Update, Alter and Drop view</li> </ul>	<b>8</b>
<b>Unit-5</b>	<b>SubQueries, Union and Indexing</b> <ul style="list-style-type: none"> <li>▪ sub queries-use, example</li> <li>▪ Set Operations- Union, Union all, Minus and Intersect</li> <li>▪ Indexing:- Advantages and disadvantages of Indexing, creating index (simple, composite, unique),multiple indexing, drop index</li> </ul>	<b>6</b>
<b>Unit-6</b>	<b>Stored Procedures, Transaction and cursor</b> <ul style="list-style-type: none"> <li>▪ Stored Procedure:- Structure, use of stored procedure, Supported SQL statements in Procedures, creating dynamic procedure, Adding record to the table using procedure, procedure with IN,OUT,INOUT parameter, dropping procedure.</li> <li>▪ Transaction :MySQL transactions, open and closing transaction, commit, rollback, savepoint in transaction, table lock</li> <li>▪ Cursor:-use of cursor, types of cursor ,opening a cursor, fetching a record from the cursor, cursor fetch statement, closing cursor</li> <li>▪ MySQL import &amp; export- Import CSV File into MySQL Table, Export MySQL Table to CSV</li> </ul>	<b>6</b>

**Reference books:** 1) MySQL(TM): The Complete Reference-Vikram Vaswani  
2) Learning MySQL, by Seyed Tahaghoghi, Hugh Williams.  
3) MYSQL 5 for professional, Ivan Bayross and Sharanam Shah

**BCA (Science)-II Semester- IV****Course Code: DSC2D (Section-II)****Total Contact Hours: Hrs.****Teaching Scheme: Theory 3 Lect./Week****Course Title: Ethics and Cyber law****Total Marks: 50(40 Lectures)****Total Credits: 02**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<b>Introduction to Cybercrime:</b> what is Cybercrime, Categories of Cybercrime Classifications of Security attacks (Passive Attacks and Active Attacks), Essential Terminology (Threat, Vulnerability, Target of Evaluation, Attack, Exploit). Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Newsgroup Spam/Crimes from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Password Sniffing, Credit Card Frauds and Identity Theft. Cyber offenses: How Criminals Plan that attack, Scanning/Scrutinizing gathered Information, Attack(Gaining and Maintaining the System Access), Social Engineering, Cyberstalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector and Cloud Computing.	
<b>Unit-2</b>	<b>Cyber Law:</b> Introduction, Information Technology Act-2000, Weakness in Information Technology Act, Amendments to the Indian IT Act, Cybercrime and Punishment, key elements certification and monitoring prevention of crimes, contract aspect, security aspects, intellectual property aspects, Intellectual Property aspect, criminal aspect.	
<b>Unit-3</b>	<b>Introduction to Ethical Hacking:</b> What is Hacking, Types of Hackers, Reasons for Hacking, Effects of Computer Hacking on an organization ,Network Security Challenges ,Elements of Information Security, The Security, Functionality & Usability Triangle, What is Ethical Hacking, Scope & Limitations of Ethical Hacking, skills required, phases of ethical hacking, tools and techniques, Black Box, Gray Box and White Box techniques, What is Penetration Testing, What is Vulnerability Auditing, differences between vulnerability assessment, Reverse engineering.	
<b>Unit-4</b>	<b>Foot Printing:</b> What is Foot Printing, Objectives of Foot Printing, Finding a company's details, Finding a company's domain name, Finding a company's Internal URLs, Finding a company's Public and Restricted URLs, Finding a company's Server details, Finding the details of domain registration, Finding the range of IP Address, Finding the DNS information, Finding the services running on the server, Finding the location of servers, Traceroute analysis, Tracking e-mail communications <b>Types of Attacks-</b> phishing, key loggers, backdoor access, password cracking, data stolen, data deleted virus attack.	

**Reference Books:**

- 1) Cyber Security: Understanding Cyber Crimes, Computer Forensics & Legal Perspectives by Nina Godbole And Sunit Belapure
- 2) Ethical Hacking and Countermeasures: Attack Phases By EC-Council
- 3) The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws Paperback –Wiley, 2nd Edition, Dafydd Stuttard,
- 4) Gray Hat Hacking The Ethical Hackers Handbook, 3rd Edition Paperback – 1 Jul 2017 by Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, McGraw Hill Education
- 5) CEH Certified Ethical Hacker Study Guide By Kimberly Graves

**BCA (Science)-II Semester- IV****Course Code: DSC3D (Section-I)****Course Title: Angular JS****Total Contact Hours: Hrs.****Total Marks: 50(40 Lectures)****Teaching Scheme: Theory 3 Lect./Week****Total Credits: 02**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<p>Overview of AngularJS: What is AngularJS?, Why AngularJS?, Features of AngularJS, AngularJS architecture, Setting up the Environment, Model-View-Controller explained, My first AngularJS app</p> <p>Directives: Introduction to Directives, Directive lifecycle, Using AngularJS built-in directives, Core Directives, Conditional Directives, Style Directives, Mouse and Keyboard Events Directives, Matching directives, Creating a custom directive</p> <p>Angular Expressions: All about Angular expressions, How to use expressions, Number and String Expressions, Object Binding and Expressions, Working with Arrays, Forgiving Behavior, Angular expressions v/s Javascript expressions</p>	<b>10</b>
<b>Unit-2</b>	<p>Controller: Role of a Controller, Attaching properties and functions to scope, Nested Controllers, Using filters in Controllers, Controllers in External Files, Controllers &amp; Modules, Controllers</p> <p>Filters: Built-in filters, Uppercase and Lowercase Filters, Currency and Number Formatting Filters, OrderBy Filter, Filter Filter, Using AngularJS filters, Creating custom filters</p> <p>AngularJS Modules: Introduction to AngularJS Modules, Module Loading and Dependencies, Creation vs Retrieval, Bootstrapping AngularJS</p>	<b>12</b>
<b>Unit-3</b>	<p>AngularJS Forms: Working with Angular Forms, Model binding, Understanding Data Binding, Binding controls to data, Form controller, Validating Angular Forms, Form events, Updating models with a twist, \$error object, Scope-What is scope, Scope lifecycle, Two way data binding, Scope inheritance, Scope &amp; controllers, Scope &amp; directives, \$apply and \$watch, Rootscope, Scope broadcasting, Scope events</p>	<b>10</b>
<b>Unit-4</b>	<p>Single Page Application(SPA): What is SPA, Pros &amp; Cons of SPA, Installing the ngRoute module, Configure routes, Passing parameters, Changing location, Resolving promises, Create a Single Page Application, AngularJS Animation: ngAnimate Module, CSS transforms, CSS transitions, Applying animations, Directives supporting animation</p>	<b>08</b>

**Reference Books**

1. Professional AngularJS by Diego Netto and Valeri Karpov- Wrox press
2. Learning AngularJS by Brad Dayley- Addison-Wesley Professiona
3. AngularJS by Brad Green and Shyam Seshadri- O'Reilly

**BCA (Science)-II Semester- IV****Course Code: DSC3D (Section-II)****Course Title: Advance Computer Networks****Total Contact Hours: Hrs.****Total Marks: 50(40 Lectures)****Teaching Scheme: Theory 3 Lect./Week****Total Credits: 02**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<b>Network layer:</b> Network layer Design issues, Routing Algorithm: Optimality Principle, Shortest Path Routing, Distance Vector Routing, Link State Routing, Broadcast Routing, Multicast Routing Congestion Control Algorithm: General principle of congestion control, Congestion prevention policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets.	<b>8</b>
<b>Unit-2</b>	<b>Transport, Session, Presentation &amp; Application layers:</b> Elements of Transport Protocols-Addressing, Connection establishment, Connection Release, Flow Control & Buffering, TCP/IP protocol suite- Transmission Control Protocol, User Datagram Protocol, IP, Real Time Transport Protocol, FTP, DNS, TelNet, SMTP, POP, HTTP, WWW, SNMP, ARP, RARP etc., Data Compression-Audio Compression, Video Compression.	<b>10</b>
<b>Unit-3</b>	<b>Network and Web Security:</b> Introduction Network security, Security Techniques- Encryption & decryption, Digital Signatures, Cryptography, Firewall Security Services, Authentication Mechanisms- Passwords, Smart Card, Biometrics. Web Security: SSL Encryption, TLS, SET, E-mail Security, PGP's / MIME, IP Security.	<b>10</b>
<b>Unit-4</b>	<b>Network Services:</b> VPN, Virtual LAN, Wi-Fi Network, Remote Sensing, GPS GPRS, GSM, Bluetooth, Video Conferencing. CASE study-Linux: Installing client & server, Roles & responsibility of Network Administrator Server Management Login Script, Ftp Server, News & search server, Web Server, Samba Server, Mail Server, Proxy Server, Print Server, User & group management.	<b>12</b>

**References Books:** 1. Computer Networking by Tannenbaum.

2. Network Security Essentials by William Stallings

3. Dorothy E. Denning, "Cryptography and Data Security", Addison-Wesley

4. Data communication and networking by William Stallings

5. Complete Reference Red Hat Enterprise Linux &amp; Fedora Edition by Petersen Haddan

**BCA (Science)-II Semester- IV****Course Code: SEC-II****Course Title: Basics of Python Programming****Total Contact Hours: Hrs.****Total Marks: 100(80 Lectures)****Teaching Scheme: Theory 6 Lect./Week****Total Credits: 04**

<b>Unit No</b>	<b>Content</b>	<b>No. of Lectures</b>
<b>Unit-1</b>	<b>Introduction to Python:</b> Features/Characteristics of Python, Installation and Working with Python, Structure of a Python Program, Writing simple python program, Executing python program using command line window and IDLE graphics window, Python Virtual Machine, Identifiers and Keywords, <b>Python Data Types:</b> Python Variables, Data types, Sequences, Sets, Literals, Constants, Type conversion, I/O Statements, Command line arguments. <b>Operators-</b> Arithmetic, Relational, Logical, Boolean, Assignment, Bit wise, Membership, Identity, Operator Precedence and Associativity <b>Conditional Statements-</b> if, if-else, nested if –else, <b>Looping-</b> for, while, nested loops, Loop manipulation using pass, continue, break, assert and else suite	<b>15</b>
<b>Unit-2</b>	<b>Array:</b> introduction, importing and slicing on array, types of array, compare and aliasing. <b>Strings:</b> Introduction to String, String Manipulation. <b>Collection List:</b> Introduction to List, Manipulating list. <b>Tuples:</b> Introduction to Tuples, Manipulating Tuples. <b>Dictionaries:</b> Concept of Dictionary, Techniques to create, update & delete dictionary items.	<b>15</b>
<b>Unit-3</b>	<b>Functions:</b> 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, <b>Modules:</b> Importing module, Creating & exploring modules, Math module, Random module, Time module <b>Object Oriented Programming:</b> 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. <b>Threads:</b> Introduction, uses, types, creating threads, thread class methods and synchronization	<b>18</b>
<b>Unit-4</b>	<b>Regular Expressions:</b> Introduction to Regular Expression, Advantages & Operations, Sequence characters in Regular Expression, Powerful pattern matching and searching, Password, email, url validation using regular expression, Pattern finding programs using regular expression <b>Exception Handling:</b> Errors in a Program, Exceptions, Exception handling, Types of Exceptions, User-defined Exceptions <b>Python File Operation:</b> Types of File, Opening and Closing a File, Reading and writing to files, Manipulating directories	<b>18</b>
<b>Unit-5</b>	<b>Graphical user interface-</b> root window, fonts and colors, working with containers, canvas, frame, widgets and its types. <b>Database connectivity-</b> Installing MySQLdb module, working with MySQL, Retrieving, inserting, Deleting and Updating rows into table, creating database tables	<b>12</b>

**Reference Books**

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 based on DSC 1 C & 1 D****Sample Programs on OOP's with C++-I and II**

- 1) Write different programs in 'C++' language that shows use of array, pointers variable, reference variable, cin and cout objects, scope resolution operators, basic operators
- 2) Write a program that shows use of class and object.
- 3) Write a program that shows parameter passing techniques in C++
- 4) Write a program that shows defining member function inside and outside of class body
- 5) Write a program that demonstrate use of inline function
- 6) Write a program to implement function overloading concept
- 7) Write a program to implement parameterized and copy constructor
- 8) Write a program that shows use of static data member and static member function.
- 9) Write a program that shows use of nesting classes.
- 10) Write a program that shows passing and returning object from function.
- 11) Write a program that shows use of new and delete operator
- 12) Write a program that shows explicit type conversion
- 13) Write a program to overload different unary and binary operators by using friend and member function.
- 14) Write a program to calculate factorial of given number by using recursion.
- 15) Write a program for addition, subtraction, multiplication and division of two complex numbers by using return by object method.
- 16) Create 2 distance classes "class A" stores distance in meter and cm and "Class B" stores distance in feet and inches and add two distances by friend function and display the result.
- 17) Generate the result for 5 students with following data - Name, exam no, Theory marks in 5 subjects, grade. Use array of object concept.
- 18) Write a program for constructor overloading.
- 19) Write a program to calculate root of quadratic equation by using default argument constructor.
- 20) Write a program to demonstrate friend function, friend class, member function of a class is friend to another class.
- 21) Write a program to count no. of objects created by using static data member & member function.
- 22) Write a program to overload unary operators (++ , -- , -).
- 23) Write a program to overload binary operator.(+ , - , \* , / , %) by using member function and friend function.

**Inheritance & Runtime polymorphism**

- 24) Write a program to implement single inheritance.
- 25) Write a program to implement multi-level inheritance
- 26) Write a program to implement multiple inheritance
- 27) Write a program to implement hierarchical inheritance
- 28) Write a program to implement hybrid inheritance
- 29) Write a program to implement multi-path inheritance
- 30) Write a program that shows use of pointer to base class
- 31) Write a program that shows use of pointer to derived class
- 32) Write a program that shows use of virtual function.
- 33) Write a program that shows use of pure virtual function.
- 34) Write a program that shows use of abstract class
- 35) Write a program that shows use of virtual destructor
- 36) Write a program that shows behavior of constructor and destructor in inheritance.

**Streams and Files**

- 37) Write a program that shows use of istream class.
- 38) Write a program that shows use of ostream class.
- 39) Write a program that shows use of different manipulators.
- 40) Write a program to read, write and append data into file.
- 41) Write a program that checks two files are identical or not.
- 42) Write a program that shows use of random access of file.
- 43) Write a program that shows use of command line argument.

**Exception Handling and template**

- 44) Write a program that shows use try, catch and throw
- 45) Write a program that shows use multiple catch blocks.
- 46) Write a program that shows use of custom exception.
- 47) Write a program that shows use of function template
- 48) Write a program that shows use of class template

### Sample Programs on Data Structure using 'C'- 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)	3) Search Vertex	5) Find adjacent Vertices
2) Display Vertices	4) Insert Edge	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 based on DSC 2 C & 2 D

#### Sample Programs 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

#### Sample Programs on RDBMS using MYSQL

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	Prajakta	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.
3. Display 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 alphabetical 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 based on DSC 3 C & 3 D****Sample Programs 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.

### Sample Programs on angular js

1. Write an angular js app which display your name, college name and class.
2. Write an angular js app which demonstrate that one way data binding and two way data binding.
3. Write an angular js app which demonstrate ng-cut, ng-copy, ng-paste directive.
4. Write an angular js app which demonstrate different directive related to keyboard.
5. Write an angular js app which demonstrate conditional directive.
6. Write an angular js app for creating custom directive which display employee id and name.
7. Write an angular js app which demonstrate all types of expressions
  - 1) Number expression
  - 2) String expression
  - 3) Object expression
  - 4) Array expression
8. Demonstrate nested controller
9. Demonstrate multiple controller
10. Demonstrate json filter
11. Demonstrate custom filter
12. Design simple single page application.
13. Custom validation in angular js.

### Sample Programs on Python

- 1) Installing Python and setting up Python environment.
- 2) Write a program to print strings, numbers and perform simple mathematical calculations.
- 3) Write a program to implement command line arguments.
- 4) Write a program to implements conditional statements -if, if-else, nested if.
- 5) Write a program to implement loops.
- 6) Write a program to manipulate strings like string copy, string concatenation, string comparison, string length, string reverse etc.
- 7) Write program to show use of Lists and Tuples.
- 8) Write program which uses dictionaries
- 9) Write program to implement functions & Modules

- 10) Write program to implement Package.
- 11) Write a program to implement Constructors.
- 12) Write a program to implement types of Inheritance and Interfaces.
- 13) Write a program to implement Method Overloading and Method Overriding.
- 14) Write a program to implement Operator Overloading.
- 15) Write a program in to read and write contents in a file.
- 16) Write a program to demonstrate Exception handling
- 17) Write a program to demonstrate user defined exception.
- 18) Write a program to demonstrate the use of regular expressions
- 19) Write a program to draw different shapes