

## BCA SCIENCE FRAMEWORK SEM-I

COURSE TYPE	COURSE CODE	SUBJECT NAME	HOURS/WEEK	CREDITS	CIA	END SEM MARKS	TOTAL	
CCT-1	19ScBCAU101	Discrete Mathematics-I	4	4	40	60	100	
CCT-2	19ScBCAU102	Programming in 'C' and Problem-Solving Methods	4	4	40	60	100	
CCT-3	19ScBCAU103	Fundamentals of Statistics	4	4	40	60	100	
CCT-4	19ScBCAU104	Fundamentals of Web Technologies (HTML, CSS)	4	4	40	60	100	
CCP-1	19ScBCAU105	Lab I: Programming in 'C' and Problem-Solving Methods	2	2	40	60	100	
CCP-2	19ScBCAU106	Lab II: Fundamentals of Web Technologies (HTML, CSS)	2	2	40	60	100	
CCP-3	19ScBCAU107	Lab III: Advanced Spreadsheet Concepts	2	2	40	60	100	
	<b>T</b>	<b>Otal</b>		<b>22</b>	<b>120</b>	<b>180</b>	<b>300</b>	
SECT-1	19CpPedU101	Physical Education – I	1	0.5	20	30	50	
	Extra	Activity Based Learning –I						
	credentials	(MOOC or IIT Spoken Tutorial like courses) Introduction to						
		Computers, HTML						

## SEM-II

COURSE TYPE	COURSE CODE	SUBJECT NAME	HOURS/WEEK	CREDITS	CIA	END SEM MARKS		
CCT-5	19ScBCAU201	Discrete Mathematics-II	4	4	40	60	100	
CCT-6	19ScBCAU202	Advanced 'C' Programming	4	4	40	60	100	

CCT-7	19ScBCAU203	Computer Organization	4	4	40	60	100
CCT-8	19ScBCAU204	Database System-I (Postgre	4	4	40	60	100
		SQL)					
CCP-4	19ScBCAU205	Lab I: Advanced 'C'	2	2	40	60	100
		Programming					
CCP-5	19ScBCAU206	Lab II: Database System-I	2	2	40	60	100
		(PostgreSQL)					
CCP-6	19ScBCAU207	Lab III: Discrete Mathematics	2	2	40	60	100
		Tutorial					
	<b>T</b>	<b>Otal</b>		<b>22</b>	<b>120</b>	<b>180</b>	<b>300</b>
SECT-2	19CpPedU201	Physical Education – II	1	0.5	20	30	50
	Extra	Activity based Learning -II					
	Credentials	(MOOC or IIT Spoken					
		Tutorial like courses),					
		Programming in 'C'					

### SEM-III

COUR SE TYPE	COURSE CODE	SUBJECT NAME	HOURS/W EEK	CREDITS	CIA	END SEM MARK S	TOTAL
CCT-9	19ScBCAU301	Data Structures	4	4	40	60	100
CCT-10	19ScBCAU302	Database System-II	4	4	40	60	100
CCT-11	19ScBCAU303	Software Engineering Practices	4	4	40	60	100
CCT-12	19ScBCAU304	Operating System Concepts	4	4	40	60	100
CCP-7	19ScBCAU305	Lab I: Data Structures	2	2	40	60	100
CCP-8	19ScBCAU306	Lab II: Database System-II	2	2	40	60	100
CCP-9	19ScBCAU307	Lab III: Case studies and Mini Project	2	2	40	60	100
<b>Total</b>				<b>22</b>	<b>120</b>	<b>180</b>	<b>300</b>
AEC-1	19CpEnvU301	Environmental Science – I		1	20	30	50
AEC-2	19CpEngU302	Business Communication-I		2.5	40	60	100

	Extra Credentials	Activity based Learning -III (MOOC or IIT Spoken Tutorial like courses: RDBMS)					
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### SEM-IV

COURSE TYPE	COURSE CODE	SUBJECT NAME	HOURS/WEE K	CREDIT S	CIA	END SEM MARK S	TOTAL	
CCT-13	19ScBCAU401	Programming in C++	4	4	40	60	100	
CCT-14	19ScBCAU402	Web Technologies-I(PHP)	4	4	40	60	100	
CCT-15	19ScBCAU403	Computer Networks and Cyber Security	4	4	40	60	100	
CCT-16	19ScBCAU404	Object Oriented Software Engineering	4	4	40	60	100	
CCP-10	19ScBCAU405	Lab I: Programming in C++	2	2	40	60	100	
CCP-11	19ScBCAU406	Lab II: Web Technologies- I(PHP)	2	2	40	60	100	
CCP-12	19ScBCAU407	Lab-III: Mini Project	2	2	40	60	100	
	<b>T</b>	<b>Otal</b>		<b>22</b>	<b>120</b>	<b>180</b>	<b>300</b>	
AEC-3	19CpEnvU401	Environmental Science – II*		1	20	30	50	
AEC-4	19CpEngU402	Business Communication-II		2.5	40	60	100	
	Extra	Activity based Learning -IV						
	Credentials	(MOOC or IIT Spoken Tutorial like courses C++)						

Progressive Education Society's

**Modern College of Arts, Science and  
Commerce,**

Shivajinagar, Pune 5  
(An Autonomous College Affiliated to  
SavitribaiPhule Pune University)

**Syllabus**

# **For B.C.A. (Science) (2019-20 Course)**

(with effect from 2020-21)

## **Abbreviations:**

**CIA:**Continuous Internal Assessment    **TH:** Theory    **TUT:** Tutorial  
**PR:**Practical  
**AEC:**Ability Enhancement Courses    **SECT:** Skill Enhancement Courses  
Theory  
**ES:** End Semester

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Second Year of B.C.A. (Science) (2019 course)**

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**Course Code : 19CsBCAU301  
Course Name : Data Structures**

**Teaching Scheme: 4 Lectures/Week      Credits: 4**

**Examination Scheme: CIA : 40 Marks      End-Sem: 60 Marks**

## **Desirable Prerequisite:**

- Students should be able to program in a standard programming language.

- Some mathematical maturity also will be expected; students should have some idea of what constitutes a mathematical proof and how to write one.

### Course Objectives:

- To understand the concepts of ADTs
- To Learn linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures

### Course Outcomes:

#### On completion of the course, Students will be able to:

- Discriminate the usage of various structures in approaching the problem solution.
- Design the algorithms to solve the programming problems.
- Use effective and efficient data structures in solving various domain problems.
- Analyze the problems to apply suitable algorithm and data structure.
- Use appropriate algorithmic strategy for better efficiency

### Course Contents

Unit No.	Title	Lectures
<b>Unit 1</b>	<b>Introduction to data structures</b>	<b>5</b>
	1.1. Data type and data object 1.2. Abstract Data Type (ADT) 1.3. Types of data structure 1.4. Algorithm analysis Space and Time complexity 1.5. Asymptotic notation – BigO, OmegaΩ Simple algorithms and its complexity as examples	
<b>Unit 2</b>	<b>Array as a data structure</b>	<b>8</b>
	2.1. Array representation- Row and column major 2.2. Sorting techniques with time complexity: Bubble sort, Selection sort, Insertion sort 2.3. Merge sort, Quick sort 2.4. Searching techniques with time Complexity: Linear search, Binary search	

<b>Unit 3</b>	<b>Linked List</b>	<b>14</b>
	3.1. Introduction 3.2. Representation -Static &Dynamic 3.3. Types of linked lists- singly, doubly, circular 3.4. Operations-create, display, insert, delete, reverse, search, sort, concatenate, merge 3.5. Applications –Generalized Linked List (GLL) concept, representation of polynomial and sets using GLL. 3.6. Case Study- Garbage Collection	
<b>Unit 4</b>	<b>Stack</b>	<b>8</b>
	4.1. Introduction 4.2. Representation -Static &Dynamic 4.3. Operations– push, pop 4.4. Applications – Infix to postfix, Infix to prefix, postfix evaluation 4.5. Recursion- concept 4.6. Case Study- 4 Queens problem	
<b>Unit 5</b>	<b>Queue</b>	<b>7</b>
	5.1 Introduction 5.2. Representation -Static &Dynamic 5.3. Operations– insert, delete 5.4. Circular queue 5.5. Priority queue 5.6. Applications	
<b>Unit 6</b>	<b>Tree</b>	<b>10</b>
	6.1. Introduction 6.2. Tree terminologies- all definitions: root, leaf, level, height, depth 6.3. Binary tree, Binary Tree Representation 6.4. Types of Binary Tree 6.5. Types of Traversal– Preorder, Inorder, Postorder 6.6. Binary Search Tree (BST) 6.7. Threaded binary tree- concepts, threading, insertion and deletion of nodes in in-order threaded binary tree, in order traversal of in-order threaded binary tree	

	6.8. AVL Tree : Concept and Rotation	
<b>Unit 7</b>	<b>Graph</b>	<b>7</b>
	7.1. Introduction 7.2. Graph terminologies 7.3. Representation – Adjacency matrix, Adjacency list, Adjacency multilist 7.4. Traversal– DFS, BFS 7.5. Greedy algorithms for computing minimum spanning tree- Prims and Kruskal Algorithms, Dijkstra's Single source shortest path	
	<b>EXPERIENTIAL LEARNING</b>	<b>1</b>

#### Reference books:

1. Fundamentals of Data Structures in C by Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, 2<sup>nd</sup> Edition, University Press, 2008, ISBN-13: 978-0929306407, ISBN-10: 0929306406
2. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 3<sup>rd</sup> Edition, Mcgraw Hill, ISBN-13: 978-0262033848, ISBN-10: 9780262033848
3. Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, 1<sup>st</sup> Edition, Pearson Education, 1983. ISBN-13: 978-0201000238, ISBN-10: 0201000237
4. Programming in C by Stephen G. Kochan, 3rd edition, Pearson Education. ISBN-13: 978-0672326660, ISBN-10: 0672326663



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**Course Code :19CsBCAU302  
Course Name: Database System-II**

**Teaching Scheme: 4**

**Lectures/Week Credits: 4**

**Examination Scheme: CIA : 40 Marks**

**End-Sem: 60 Marks**

**Desirable Prerequisite:**

- Student should have Basic Knowledge of DBMS is required.
- Basic Knowledge of ER model, relational design ,SQL Queries is required

**Course Objectives:**

- To learn fundamental concepts of RDBMS (PL/PgSQL)
- To learn database management operations
- To understand the basic issues of transaction processing and concurrency control
- To study data security and its importance

**Course Outcomes:**

**On completion of the course, student will be able to:**

- Design E-R Model for given requirements and convert the same into database tables.
- Use database techniques such as SQL & PL/SQL(function, procedure, exception, cursors and triggers)
- Explain transaction Management in relational database System.
- Use advanced database Programming concepts.

**Course Contents**

Unit No.	Title	Lectures
<b>Unit 1</b>	<b>Relational Database Design</b>	<b>18</b>
	1.1. PL/Pgsql: Language structure 1.2. Controlling the program flow, conditional statements, loops 1.3. Views 1.4. Functions 1.5. Handling errors and exceptions 1.6. Cursors 1.7. Triggers	
<b>Unit 2</b>	<b>Transaction Concepts and Concurrency Control</b>	<b>16</b>
	Transaction, properties of transaction, states of transactions Concurrent execution of transactions and conflicting operations Schedules, types of schedules Concept of Serializability, conflict Serializability Lock based protocols Two phase locking protocol (2PL) Timestamp ordering protocol Deadlock handling methods 2.8.1 Detection and Recovery (Wait for graph) 2.8.2 Prevention algorithms (Wound-wait, Wait-die)	
<b>Unit 3</b>	<b>Crash Recovery</b>	<b>13</b>
	Transaction Failure classification Recovery concepts Checkpoints	

	Recovery with concurrent transactions (Rollback, checkpoints, commit) Log base recovery techniques (Deferred and Immediate update) Buffer Management 3.7 Shadow paging	
<b>Unit 4</b>	<b>Database Security</b>	<b>6</b>
	Introduction to database security concepts Methods for database security Discretionary access control method Mandatory access control method	
<b>Unit 5</b>	<b>Introduction to Emerging Database Technologies</b>	<b>6</b>
	Limitations of Conventional Databases Multimedia Database Temporal Databases Spatial Databases Cloud Databases Google Big Table NoSQL SQLite	
	<b>EXPERIENTIAL LEARNING</b>	<b>1</b>

### Reference Books:

1. Database System Concept by Avi Silberschatz, Henry F. Korth, S. Sudarshan, 6<sup>th</sup> Edition-McGraw-Hill ISBN-10: 0073523321
2. Fundamentals of Database Systems by Ramez Elmasri, Shamkant Navathe, 5th Edition–Pearson.
3. Practical Postgresql by JoshuaD. Drake, John C Worsley, O'Reilly Publications. ISBN: 9781449309770
4. Database Management Systems by Raghu Ramakrishnan, 3<sup>rd</sup> Edition, Tata McGraw Hill ISBN: 9789339204075, 9339204077
5. Database Management System by Bipin Desai , ISBN: 0314667717, 9780314667717

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**Course Code : 19CsBCAU303  
Course Name : Software Engineering Practices**

**Teaching Scheme: 4 Lectures/Week**

**Credits: 4**

**Examination Scheme: CIA : 40 Marks**

**End-Sem : 60 Marks**

**Desirable Prerequisites:**

- Problem solving and object oriented programming.
- Fundamental of data structures

**Course Objectives:**

- To understand the phases in a software project
- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the various software design methodologies
- To learn various testing and maintenance measures

## Course Outcomes:

### On completion of the course, Students will be able to:

- To identify unique features of various software application domains and classify software applications.
- To choose and apply appropriate lifecycle model of software development.
- To describe principles of agile development, discuss the SCRUM process and distinguish agile process model from other process models.
- To analyze software requirements by applying various modeling techniques.
- To list and classify CASE tools and discuss recent trends and research in software engineering.
- To understand IT project management through life cycle of the project and future trends in IT Project Management.

## Course Contents

Unit No.	Title	Lectures
Unit 1	System Concepts	6
	1.1. System Definition 1.2. Characteristics of a System: Organization, Subsystem, Interaction, Interdependence, Integration, Central objective, Standards, Black-box 1.3. Elements of a system: Outputs, Inputs, Processor(s), Control, Feedback, Environment, Boundaries, Interface. 1.4. Types of Systems: Physical & Abstract Systems, Open & Closed Systems, Computer-based Systems (MIS: Management Information System & DSS: Decision Support System)	

<b>Unit 2</b>	<b>Software and Software Engineering</b>	<b>5</b>
	2.1 The Nature of Software 2.1.1 Defining Software 2.1.2 Software Application 2.1.2.1 Domain 2.1.3 Legacy Software 2.2 Software Engineering 2.3 The Software Process 2.4 Software Engineering Practice 2.4.1 The Essence of Practice 2.4.2 General Principles 2.5 Mc Call's Quality Factors	
<b>Unit 3</b>	<b>System Development Life Cycle (SDLC)</b>	<b>9</b>
	3.1 Introduction 3.2 Activities of SDLC 3.2.1 Preliminary Investigation (Request, Clarification, Feasibility Study, Request Approval) 3.3 Determination of System Requirements 3.4 Design of System 3.5 Development of Software 3.6 System Testing (Unit Testing, Integration testing, System Testing) 3.7 System Implementation & Evaluation	
<b>Unit 4</b>	<b>Process Models</b>	<b>8</b>
	4.1. A Generic Process Model 4.2. Prescriptive Process Models 4.1.1. The Waterfall Model 4.1.2. Incremental Process Models 4.1.3. Evolutionary Process Models 4.1.4. Prototyping 4.1.5. Spiral Model 4.1.6. RAD Model (Rapid Application Development Model) 4.3. Concurrent Models	
<b>Unit 5</b>	<b>Requirements Engineering</b>	<b>9</b>
	5.1. Introduction 5.2. Requirements Engineering Task 5.1.1. Inception	

	5.1.2.Elicitation 5.1.3.Elaboration 5.1.4.Negotiation 5.1.5.Specification 5.1.6.Validation 5.1.7.Requirements Management 5.3. Feasibility Study 5.4. Fact Finding Techniques 5.4.1. Interview 5.4.2. Questionnaire	
<b>Unit 6</b>	<b>Structured Analysis and Design Tools</b>	<b>8</b>
	6.1. Structured Analysis 6.1.1. What is Structured Analysis? 6.1.2. Components of Structured Analysis 6.1.3. What is Data Flow Analysis? 6.2. Features& Tools of Data Flow Analysis 6.2.1. Logical Data Flow Diagram (Logical DFD) 6.2.2. Notations 6.2.3. Drawing a Context Diagram 6.2.4. Exploding A Context diagram into Greater detail(1st level, 2 <sup>nd</sup> Level DFD etc...) 6.2.5. Evaluating Data Flow Diagram for Correctness 6.3. E-R Diagram 6.4. Case Study 6.5. Concept of Data Dictionary	
<b>Unit 7</b>	<b>Maintenance and Reengineering</b>	<b>5</b>
	7.1. Maintenance definition and types 7.2. Software Reengineering 7.3. Reverse Engineering 7.4. Restructuring and forward Engineering	
<b>Unit 8</b>	<b>An Agile View of Process</b>	<b>9</b>
	8.1. What is an Agility? 8.2. What is an Agile Process? 8.2.1. The Politics of Agile Development 8.2.2. Human Factors 8.3. Agile Process Models	

	8.3.1. Extreme Programming (XP) 8.3.2. Adaptive Software Development (ASD) 8.4. Dynamic Systems Development Method (DSDM) 8.5 What is retrospective? 8.5.1 Need 8.5.2 key factors	
	<b>EXPERIENTIAL LEARNING</b>	<b>1</b>

**Note: Case study should be considered as a Part of Internal Evaluation**

**Reference books:**

1. Software Engineering: A Practitioner's Approach by Roger S Pressman, McGraw-Hill, Seventh or 8<sup>th</sup> Edition, ISBN: 0073375977.
2. System analysis and Design of Information system by James Senn, McGraw-Hill, 7<sup>th</sup> or 8<sup>th</sup> Edition, ISBN-10: 0070562369 ISBN-13: 978-0070562363
3. IT Project Management –On Track From Start to Finish by Joseph Phillips , Tata Mc Graw-Hill, ISBN13: 978-0-07106727-0, ISBN-10: 0-07-106727-2.

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**Shivajinagar, Pune – 5**  
**Second Year of B.C.A. (Science) (2019 course)**  
**Course Code : 19CsBCAU304**  
**Course Name : Operating Systems**

**Teaching Scheme: 4 Lectures/Week**

**Credits: 4**

**Examination Scheme: CIA : 40 Marks**

**End-Sem : 60 Marks**

**Desirable Prerequisites:**

Students should have basic knowledge of Computer Science and Computer Organization



**Course Objectives:**

- To Study the basic concepts and functions of operating systems.
- To Understand the structure and functions of OS.
- To Learn about Processes, Threads and Scheduling algorithms.
- To Understand the principles of concurrency and Deadlocks.
- To Learn various memory management schemes.
- To Study I/O management and File systems.
- To Learn the basics of the Linux system and perform administrative tasks on Linux Servers.

**Course Outcomes:****On completion of the course, Students will be able to:**

- Design various Scheduling algorithms.
- Apply the principles of concurrency.
- Design deadlock, prevention, and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Design and Implement a prototype file systems.
- Perform administrative tasks on Linux Servers
- Get Introduction to Android Operating System Internals

**Course Contents**

Unit No.	Title	Lectures
Unit 1	<b>Introduction to Operating Systems</b>	<b>6</b>
	1.1.Defining Operating System 1.2.Computer System Architecture 1.3.Operating System Operations 1.4.Operating System Services 1.5.Special Purpose Systems 1.6.Computer Environment – Traditional computing, Client server computing, Peer to peer Computing 1.7.Operating System Structure	

	1.8.Virtual Machines – Introduction, Benefits System Boot	
<b>Unit 2</b>	<b>System Structure</b>	<b>4</b>
	2.1.User Operating -System Interface –Command interpreter, GUI 2.2.System Calls 2.3.Types of System Calls – Process control, File management, Device management, Information maintenance, Communication, Protection 2.4.Linux System calls related to file and directory management	
<b>Unit 3</b>	<b>Process Concept</b>	<b>6</b>
	3.1.Process Concept - Process, Process State, PCB 3.2.Process scheduling 3.3.Operations on processes, Linux System calls related to process 3.4.Inter-process communication	
<b>Unit 4</b>	<b>CPU Scheduling</b>	<b>6</b>
	4.1.Process Scheduling 4.2.Basic Concept - CPU-I/O burst cycle, CPU scheduler, Preemptive scheduling, Dispatcher 4.3.Scheduling Criteria 4.4.Scheduling Algorithms - FCFS, SJF, Priority scheduling, Round-robin scheduling, 4.5.Multiple queue scheduling, Multilevel feedback queue scheduling	
<b>Unit 5</b>	<b>Deadlock Management</b>	<b>6</b>
	5.1.Deadlocks 5.2.System model 5.3.Deadlock Characterization - Necessary conditions, Resource allocation graph 5.4.Deadlock Prevention 5.5.Deadlock Avoidance - Safe state, Resource allocation graph algorithm,	

	Banker's Algorithm 5.6. Deadlock Detection 5.7. Recovery from Deadlock - Process termination, Resource preemption	
<b>Unit 6</b>	<b>Process Synchronization</b>	<b>3</b>
	6.1. Background 6.2. Critical Section Problem 6.3. Semaphores: Usage, Implementation	
<b>Unit 7</b>	<b>Memory Management</b>	<b>10</b>
	7.1. Address binding 7.2. Logical versus physical address space, Dynamic loading, Dynamic linking and shared libraries 7.3. Swapping 7.4. Contiguous Memory Allocation - Memory mapping and protection, Memory allocation, Fragmentation 7.5. Paging - Basic method, Hardware support, Protection, Shared Pages 7.6. Segmentation - Basic concept, Hardware 7.7. Virtual Memory Management - Demand paging, Performance of demand paging, Page replacement - FIFO, OPT, LRU, Second chance page replacement	
<b>Unit 8</b>	<b>File System</b>	<b>6</b>
	8.1. File Concept 8.2. Access Methods - Sequential, Direct 8.3. Directory and Disk Structure – Storage structure, Directory overview, Single level directory, Two level directory, Tree structure directory, Acyclic graph directory, General graph directory 8.4. Allocation Methods - Contiguous allocation, Linked allocation, Indexed allocation 8.5. Free Space Management - Bit vector,	

	Linked list	
<b>Unit 9</b>	<b>Disk System</b>	<b>7</b>
	9.1. Overview 9.2. Disk Structure 9.3. Disk Scheduling and Disk Scheduling Algorithms(FCFS,SSTF,SCAN,LOOK, C-SCAN,C-LOOK)	
<b>Unit 10</b>	<b>CASE STUDY</b>	<b>5</b>
	10.1 Linux System Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; 10.2 Mobile OS – iOS and Android – Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System. 10.3 Object file formats-a.out, ELF, COFF, EXE, COM,PE	
	<b>EXPERIENTIAL LEARNING</b>	<b>1</b>

### Reference books:

- Operating System Concepts by Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, 9th Edition, John Wiley and Sons Inc., 2012. ISBN-10: 1118063333 ISBN-13: 978-1118063330
- Operating System Concepts by James L. Peterson, Abraham Silberschatz, Addison-Wesley, 3<sup>rd</sup> Edition, ISBN-13: 978-0201513790 ISBN-10: 020151379X
- Modern Operating Systems by Andrew S. Tanenbaum, 4<sup>th</sup> Edition, Addison Wesley, 2001. ISBN-13: 978-0133591620 ISBN-10: 013359162X
- The Operating Systems: A Concept-Based Approach by D M Dhamdhare, 3<sup>rd</sup> Edition, Tata Mc Graw-Hill Education, ISBN-10: 1259005585 ISBN-13: 978-1259005589
- The Operating Systems – Internals and Design Principles by William Stallings, 7th Edition, Prentice Hall, 2011. ISBN-13: 978-0133805918 ISBN-10: 0133805913

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Second Year of B.C.A. (Science) (2019 course)  
Course Code: 19CsBCAU305  
Course Name:(Lab I) Data Structures**

**Teaching Scheme: PR: 2 Hours/ Week**

**Credit: 02**

**Examination Scheme: CIA: 40 Marks**

**End-Sem: 60 Marks**

Sr.No.	Title of the assignment
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1	Non-Recursive Sorting Techniques 1.Bubble Sort 2.Insertion Sort 3.Selection Sort
2	Recursive Sorting Techniques 1.Quick Sort 2.Merge Sort
3	Searching Techniques 1.Linear search 2.Binary Search
4	Linked List 1.Singly Linked List 2.Singly Circular Linked List 3.Doubly Linked List 4.Doubly Circular Linked List 5.Static Linked List (Using Array)
5	Stack 1.Static Stack Implementation 2.Dynamic Stack Implementation
6	Queue 1.Static Queue Implementation 2.Dynamic Queue Implementation
7	Binary Search tree (Dynamic)
8	Graph 1.Adjacency Matrix Representation 2.Adjacency List Representation

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**Second Year of B.C.A. (Science) (2019 course)**  
**Course Code: 19CsBCAU306**  
**Course Name: (Lab II) Database System-II**

**Teaching Scheme: PR: 2 Hours/ Week**

**Credit: 02**

**Examination Scheme: CIA: 40 Marks**

**End-Sem: 60 Marks**

<b>Sr.No</b>	<b>Assignment</b>
1	Nested queries
2	Views
3	Functions and stored Procedures
4	Error and exception Handling
5	Cursors
6	Trigger

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**Course Code: 19CsBCAU307**  
**Course Name: (Lab III) Operating Systems**

<b>Teaching Scheme: PR: 2 Hours/ Week</b>	<b>Credit: 02</b>
<b>Examination Scheme: CIA: 40 Marks</b>	<b>End-Sem: 60 Marks</b>

<b>Sr.No.</b>	<b>Name of the assignment</b>
1	CPU Scheduling
2	Deadlock Avoidance
3	Page Replacement Algorithms
4	File Allocation Techniques
5	Disk Scheduling Algorithms

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**Second Year of B.C.A. (Science) (2019 course)**  
  
**Course Code : 19CsBCAU401**  
**Course Name : Programming in C++**



**Teaching Scheme: 4 Lectures/Week**

**Credits: 4**

**Examination Scheme: CIA : 40 Marks**

**End-Sem : 60 Marks**

**Desirable Prerequisite:**

1. Students should be able to program in a standard programming language
2. Students should have logical skill.

**Course Objectives:**

1. To expose the student to procedural programming using C++ and to increase the depth of students' knowledge about several implementation issues
2. To Understand object oriented programming
3. To Gain knowledge about the capability to store information together in an object
4. To improve your problem solving skills

**Course Outcomes:**

**At the end of the course, Students will be able to:**

1. Understand the difference between the top-down and bottom up approach
2. Apply the concepts of object-oriented programming
3. Apply virtual and pure virtual function & complex programming situations

**Course Contents**

Unit No.	Title	Lectures
<b>Unit 1</b>	<b>Object oriented concepts</b>	<b>4</b>
	1.1.Object oriented concepts 1.2.Features 1.3.Applications	
<b>Unit 2</b>	<b>Introduction to C++</b>	<b>6</b>
	2.1.Data types, new operators and keywords 2.2.Using namespace concept 2.3.Simple C++ Program 2.4.Introduction to Reference variables	

	2.5. Usage of 'this' pointer 2.6. Classes and Objects 2.7. Access specifiers 2.8. Defining Data members and Member functions 2.9. Array of objects	
<b>Unit 3</b>	<b>Constructors and destructor</b>	<b>7</b>
	3.1. Constructor 3.2. Types of constructors 3.3. Dynamic Constructors (new and delete) 3.4. Destructor	
<b>Unit 4</b>	<b>Function in C++</b>	<b>7</b>
	4.1. Call by reference 4.2. Return by reference Function overloading and default arguments 4.3. Inline function 4.4. Static class members 4.5. Friend Concept – Function, Class	
<b>Unit 5</b>	<b>Operator overloading</b>	<b>8</b>
	5.1. Overloading Unary and Binary operators 5.2. Overloading using friend function 5.3. Type casting and Type conversion	
<b>Unit 6</b>	<b>Inheritance</b>	<b>8</b>
	6.1. Types of inheritance with examples 6.2. Constructors and destructor in derived classes 6.3. Virtual base classes, Virtual functions and Pure virtual function 6.4. Abstract base classes	
<b>Unit 7</b>	<b>Working with files and Managing I/O</b>	<b>8</b>
	7.1. C++ stream classes 7.2. Formatted and unformatted console I/O 7.3. Usage of manipulators 7.4. Working with files 7.5. File operations – Text files, Binary files 7.6. File stream class and methods 7.7. File updation with random access	
<b>Unit 8</b>	<b>Templates</b>	<b>6</b>
	8.1. Introduction to templates 8.2. Class templates, function templates and	

	overloading of function templates 8.3. Templates with multiple parameters	
<b>Unit 9</b>	<b>Exception Handling in C++</b>	<b>5</b>
	9.1. try, catch and throw primitives 9.2. try with multiple catch 9.3. throws 9.4. rethrowing mechanism	
	<b>EXPERIENTIAL LEARNING</b>	<b>1</b>

**Reference books:**

1. Object Oriented Programming with C++ by E. Balagurusamy, 6<sup>th</sup> Edition, ISBN: 9332900906, 9789332900905
2. The Complete Reference C++ by Herbert Schildt, 4<sup>th</sup> Edition, ISBN: 9780070411838, 9780070411838
3. Object Oriented Programming with C++ by Robert Lafore, 4<sup>th</sup> Edition, ISBN: 9788131722824, 9788131722824

**Progressive Education Society's  
Modern College of Arts, Science and Commerce, (Autonomous)  
Shivajinagar, Pune – 5  
Second Year of B.C.A. (Science) (2019 course)**

**Course Code : 19CsBCAU402  
Course Name : Introduction to Web Technology**

**Teaching Scheme: 4 Lectures/Week**

**Credits: 4**

**Examination Scheme: CIA : 40 Marks**

**End-Sem : 60 Marks**

**Desirable Prerequisite:** One must have knowledge of HTML and CSS .

**Course Objectives:**

1. To Learn Core-PHP, Server Side Scripting Language
2. To Learn Database handling in PHP.
3. To understand PHP framework for effective design of web application.

**Course Outcomes:**

On completion of the course, Students will be able to design dynamic and interactive Web pages with database connectivity.

**Course Contents**

<b>Unit No.</b>	<b>Title</b>	<b>Total Lectures</b>
<b>Unit 1</b>	<b>Introduction to web techniques</b>	<b>10</b>
	1.1 What is WEB.?	
	1.2 Introduction to Web Browser and Web Server	
	1.3 What are Scripting languages?	
	1.4 Programming languages vs Scripting languages	
	1.5 What does PHP stands for ?	
	1.6 Why to use PHP ?( Uses of Web Application)	
	1.7 HTTP basics	
	1.8 Lexical structure	

- 1.9 Language basics
- 1.10 Comparison of PHP with other Web technologies.

<b>Unit 2</b>	<b>Strings</b>	<b>13</b>
	2.1 Php is called loosely type language	
	2.2 Difference between single quote and	
	2.3 Double quote in php	
	2.4 Heredoc Presentation in strings	
	2.5 Functions to perform operations on strings	
	2.6 Functions to perform modifications in strings	
	2.7 Printing functions	
	2.8 Encoding and escaping	
	2.9 include( ) and require( ) function in php	
	2.10 Types of Regular Expression	
	2.10.1 POSIX Style	
	2.10.2 PERL Style	
<b>Unit 3</b>	<b>Functions in php</b>	<b>7</b>
	3.1 Why use Functions ?	
	3.1.1 Resuability	
	3.1.2 Easier error detection	
	3.1.3 Easily maintained	
	3.2 Defining and calling a function	
	3.2.1 Function parameter	
	3.2.2 Setting default parameter for functions	
	3.2.3 Pass by value	
	3.2.4 Pass by reference	
	3.3 Anonymous function	
	3.4 Under Standing variable scope	
<b>Unit 4</b>	<b>Arrays</b>	<b>11</b>
	4.1 Declare Array in PHP	
	4.2 Types of Array in PHP	
	4.2.1 Indexed Array	
	4.2.3 Associative Array	
	4.3 Multi-dimensional Array	
	4.4 Sorting Functions in Array	
	4.5 Searching functions in Array	
	4.6 Comparing array in PHP	

	4.7 Action on entire arrays	
	4.8 Extracting multiple values	
	4.9 Converting between arrays and variables	
<b>Unit 5</b>	<b>Object oriented programming in php</b>	<b>9</b>
	5.1 Object Oriented Programming Principles	
	5.2 Create class and Object in PHP	
	5.3 Implement Inheritance in PHP	
	5.4 Interface in PHP	
	5.5 Introspection in PHP	
<b>Unit 6</b>	<b>Database Handling (PHP with POSTGRESQL)</b>	<b>9</b>
	6.1 PHP connect to PostgreSQL using native methods	
	6.2 To connect to PostgreSQL using PDO/PEARDB basics.	
	6.3 Configure Database Connection	
	6.4 Persistent Connections	
	6.5 Executing Different functions of Postgresql	
	<b>EXPERIENTIAL LEARNING</b>	<b>1</b>

### Reference books:

1. PHP Reference : Beginner to Intermediate PHP5 paperback by Mario Luring, Lulu.com Publication, ISBN -10: 143571590X, ISBN-13: 978-1435715905
2. PHP Pocket Reference 2<sup>nd</sup> Edition by Rasmus Lerdorf, O Reilly Media Publication, ISBN-10: 0596004026, ISBN-13: 978-0596004026
3. PHP A Beginner Guide by Vikram Vaswani, McGraw-Hill Education, ISBN-10: 00171549013, ISBN-13: 978-0071549011
4. PHP The Complete Reference by Holzner Steven, Abebooks Publication, ISBN-10: 0071508546, ISBN-13: 9780071508544

### Websites:

1. [www.php.net.in](http://www.php.net.in)
2. [www.W3schools.com](http://www.W3schools.com)
3. <https://api.drupal.org>

**Progressive Education Society's  
Modern College of Arts, Science and Commerce, (Autonomous)  
Shivajinagar, Pune – 5  
Second Year of B.C.A. (Science) (2019 course)**

**Course Code : 19CsBCAU403  
Course Name: Computer Networks**

**Teaching Scheme: 4 Lectures/Week**

**Credits: 4**

**Examination Scheme: CIA : 40 Marks**

**End-Sem : 60 Marks**

**Prerequisite:**

- Basic knowledge of networking concepts is required

**Course Objectives:**

1. To understand the fundamental concepts of computer networking.
2. To learn the basic taxonomy and terminology of the computer networking area.

**Course Outcomes:**

**On completion of the course, students will be able to:**

- Independently understand basic computer network technology.
- Understand and explain Data Communications System and its components.
- Identify the different types of network topologies and protocols.
- Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
- Identify the different types of network devices and their functions within a network
- Understand and building the skills of subnetting and routing mechanisms.
- Be familiar with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

## Course Contents

Unit No.	Title	Lectures
<b>Unit 1</b>	<b>An Introduction to Networks, Network Topologies and Types</b>	<b>10</b>
	1.1.Data communications and representation Information Exchange, Sharing, preserving &protecting 1.2.Hardware and Software Resource Sharing 1.3.Computer Networks-Goals and applications –Business Application, Home Application, Mobile User, Social Issues 1.4.Network Hardware -Broadcast and point-to-point 1.5.Clients, Servers, Peers based and Hybrid Networks 1.6.Network Topologies (Bus, Star, Ring, Star Bus, Mesh) 1.7.Network Types- LAN, MAN, WAN, PAN, Wireless Networks, Home Networks, Internetwork	
<b>Unit 2</b>	<b>Network Models</b>	<b>5</b>
	1.1.OSI Reference Model Functionality of each layer 1.2.TCP/IP Reference Model 1.3.Addressing Physical, Logical and Port addresses	
<b>Unit 3</b>	<b>Physical Layer</b>	<b>12</b>
	2.1.Analog and Digital data, Analog and Digital signals, Periodic & Non periodic signals, Digital Signals-Bit rate, bit length, baseband Transmission. 2.2.Transmission Impairments–attenuation, distortion and noise, Data Rate Limits– Noiseless channel:	



	<p>Nyquist's bit rate, noisy channel : Shannon's law</p> <p>2.3.Performance of the Network Bandwidth, Throughput, Latency(Delay), Bandwidth – Delay Product, Jitter</p> <p>2.4.Line Coding Characteristics, Line Coding Schemes–Unipolar -NRZ, Polar-NRZ-I, NRZ-L, RZ, Manchester and Differential Manchester, Problems</p> <p>2.5.Transmission Modes, Parallel Transmission and Serial Transmission– Asynchronous and Synchronous and Isochronous</p> <p>2.6.Trunks &amp; Multiplexing FDM and TDM</p> <p>2.7.Switching-Circuit Switching, Message Switching and Packet Switching</p> <p>2.8.Physical Layer Devices: Repeaters, Hubs-active hub Passive hub</p>	
<b>Unit 4</b>	<b>Data Link Layer</b>	<b>10</b>
	<p>3.1.Design Issues–Services provided to the Network Layer, Framing– Concept, Methods–Character Count, Flag bytes with Byte Stuffing, Starting &amp; ending Flags with Bit Stuffing and Physical Layer Coding Violations, Flow and Error Control</p> <p>3.2.Error detection code CRC</p> <p>3.3.Random Access Protocols ALOHA– pure and slotted, CSMA- 1- persistent, p-persistent and non-persistent CSMA/CD, CSMA/CA</p> <p>3.4.Controlled Access Reservation, Polling and Token Passing concept</p>	
<b>Unit 5</b>	<b>Network Layer</b>	<b>10</b>
	<p>4.1.IPv4 addresses: address space, Classful addressing, Classless addressing, NAT</p> <p>4.2.IPv6 addresses: Structure, address space</p> <p>4.3.IPv4: Datagram, Fragmentation, checksum, options</p> <p>4.4.IPv6: advantages, packet format, Extension headers</p>	
<b>Unit 6</b>	<b>Transport Layer</b>	<b>12</b>
	<p>5.1.Process-to-Process Delivery Client Server Paradigm, Multiplexing and De-multiplexing,</p>	

	<p>Connectionless Vs Connection-Oriented Service, Reliable Vs Unreliable</p> <p>5.2. User Datagram Protocol(UDP) Datagram Format, Checksum, UDP operations, Use of UDP</p> <p>5.3. Transmission Control Protocol (TCP) TCP Services –Process to-Process Communication, Stream Delivery Service, sending and Receiving Buffers, Segments, Full –Duplex Communication, Connection oriented service, Reliable service</p> <p>5.4. TCP Features –Numbering System, Byte Number, Sequence Number, Acknowledgement Number, Flow Control, Error Control, Congestion Control</p> <p>5.5. TCP Segment Format</p>	
	<b>EXPERIENTIAL LEARNING</b>	<b>1</b>

### Reference books:

1. Computer Networks by Andrew Tanenbaum ,Pearson Education 4th Edition , ISBN 10:0130661023 / ISBN 13:9780130661029
2. Data Communication and Networking by Behrouz Forouzan , TATA McGraw Hill 4<sup>th</sup> Edition ,ISBN:9780070634145, 0070634145
3. Networking All In One Dummies by Doug Lowe ,Wiley Publication ,7<sup>th</sup> Edition, ISBN – 13: 987-0764575839,ISBN – 10 : 076457583X

**Progressive Education Society's  
Modern College of Arts, Science and Commerce, (Autonomous)  
Shivajinagar, Pune – 5  
Second Year of B.C.A. (Science) (2019 course)**

**Course Code :19CsBCAU404  
Course Name : Object Oriented Software Engineering**

**Teaching Scheme: 4 Lectures/Week**

**Credits: 4**

**Examination Scheme: CIA : 40 Marks**

**End-Sem : 60 Marks**

**Desirable Prerequisite:**

Familiarity with the C++ programming language and Software Engineering concepts.

**Course Objectives:**

To provide an in depth knowledge on software life-cycle process with object-oriented concept.

**Course Outcomes:**

**On completion of the course, Students will be able to:**

1. Understand different software life cycle concept.
2. Study and design SRS documents for software projects.
3. Study and model software projects using different modeling techniques.

**Course Contents**

Unit No	Title	Lectures
1	Object Oriented Concepts and Modeling	8

	1.1.What is Object Orientation? (Introduction to class, Object, inheritance, polymorphism) 1.2.Model 1.2.1. Importance of Modeling 1.2.2. Object Oriented Modeling 1.3.Object oriented system development 1.4.Function/data methods 1.4.1. Object oriented analysis 1.4.2. Object oriented construction 1.4.3. Object oriented testing 1.5.Identifying the elements of an object model 1.5.1. Identifying classes and objects 1.5.2. Specifying the attributes 1.5.3. Defining operations 1.6.Finalizing the object definition	
<b>2</b>	<b>Introduction to UML</b>	<b>6</b>
	1.1.Overview of UML 1.2.Conceptual Model of UML 1.3.Architecture	
<b>3</b>	<b>Structural Modeling</b>	<b>15</b>
	2.1.Classes Relationship, Common mechanism, Diagrams, 2.2.Class diagram 2.3.Advanced classes, 2.4.Advanced Relationship, 2.5.Interface, 2.6.Types and Roles, 2.7.Packages, 2.8.Object Diagram 2.9.Case Study (Minimum Two)	
<b>4</b>	<b>Behavioral Modeling</b>	<b>15</b>

	3.1.Interactions 3.2.Use cases, 3.3.Use Case Diagram 3.4.Interaction Diagram 3.5.Activity Diagram 3.6.State chart Diagram 3.7.Case Study (Minimum Two)	
<b>5</b>	<b>Architectural Modeling</b>	<b>10</b>
	4.1.Components, 4.2.Component Diagram 4.3.Deployment Diagram 4.4.Case Study (Minimum Two)	
<b>6</b>	<b>Object Oriented Testing</b>	<b>5</b>
	5.1.Overview of Testing and object oriented Testing 5.2.Types of Testing 5.3.Object oriented Testing strategies 5.4.Test case design for OO software 5.5.Inter class test case design	
	<b>EXPERIENTIAL LEARNING</b>	<b>1</b>

### Reference books:

- 1)The Unified Modeling Language,User Guide by Grady Booch, James Raumbaugh, Ivar Jacobson, **ISBN**: 0321267974.
- 2)Object Oriented Software Engineering by Ivar Jacobson, **ISBN**: 9780201544350
- 3)Software Engineering by Roger S. Pressman, **ISBN**: 9780078022128
- 4) Applying UML and Patterns by Craig Larman, **ISBN**-10: 8177589792

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Second Year of B.C.A. (Science) (2019 course)**

**Course Code: 19CsBCAU405  
Course Name: (Lab I) Programming in C++**

**Teaching Scheme: PR: 2Hours/ Week  
Examination Scheme: CIA: 40 Marks**

**Credit: 02  
End-Sem: 60 Marks**

<b>Sr. No.</b>	<b>Assignment Name</b>
1	Introduction to C++(Basic programs using Control structures and Loops)
2	Classes and Objects(Programs using classes, array of Objects, Static Members)
3	Functions in C++(Inline Function, friend function, function with default argument, Constant Function, Function Overloading)
4	Constructor and Destructor(Using default, parameterized and copy constructor)
5	Operator Overloading
6	Inheritance(Program using all types of Inheritance)
7	Virtual Functions & Polymorphism
8	File Handling(Programs using all file operations)
9	Exception Handling
10	Templates(Programs using Class and Function Templates)

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**Course Code: 19CsBCAU406  
Course Name: (Lab II) Web Technologies(PHP)**

**Teaching Scheme: PR: 2Hours/ Week**

**Credit: 02**

**Examination Scheme: CIA: 40 Marks**

**End-Sem: 60 Marks**

<b>Sr. No.</b>	<b>Assignment Name</b>
1	Introduction to Programming in PHP (Programs using Language Basics, Form Handling)
2	String manipulation and Regular Expressions
3	Arrays (Indexed and Associative Arrays)
4	Functions (User defined and Anonymous Functions)
5	Object Oriented Programming (Inheritance ,Interfaces, Introspection)
6	Database Handling (Database handling programs Using Postgresql)

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**Course Code: 19CsBCAU407  
Course Name: (Lab III) Mini Project**

**Teaching Scheme: PR: 2Hours/ Week**

**Credit: 02**

**Examination Scheme: CIA: 40 Marks**

**End-Sem: 60 Marks**

<b>CIA: 40 marks</b>	<b>End-Sem:60 Marks</b>
<b>Lab book (20 Marks)</b>	<b>External Viva(10 Marks)</b>
<b>Internal Viva(10 Marks)</b>	<b>Viva on S/W modelling tool – e.g. Star UML (10 Marks)</b>
<b>Internal Assessment (Study on Open Source S/W modelling tool e.g. Star UML) (10 Marks)</b>	<b>External Assessment(40 Marks)</b>

**Note:**

**Star UML:**

StarUML is an open source software modeling tool that supports the UML (Unified Modeling Language) framework for system and software modeling. It actively supports the MDA (Model Driven Architecture) approach by supporting the UML profile concept and allowing to generate code for multiple languages.