



**M.C.E. Society's**

**ABEDA INAMDAR SENIOR COLLEGE OF ARTS, SCIENCE AND  
COMMERCE (AUTONOMOUS), PUNE**

**AZAM CAMPUS, CAMP, PUNE – 411001**

## **Syllabus of B.C.A. (Science)**

**Applicable for the Autonomous College affiliated to**

**Savitribai Phule Pune University**

**BCA Science (Honours) Four Year Degree Programme  
(Choice Based Credit System)**

**(2023 Pattern)**

**With effect from June 2023**

# Preamble

## **Introduction:**

Bachelor of Computer Application (BCA Science Honours) is a full-time four-year programme offered by Abeda Inamdar Senior College for Arts, Commerce and Science (Autonomous) affiliated to Savitribai Phule Pune University (SPPU). This programme has aim of providing students with a comprehensive and interdisciplinary education in the field of computer applications. The programme emphasizes the development of analytical and problem-solving skills, creativity, and innovation, with a focus on practical applications of technology in real-world settings.

The curriculum is designed to prepare students for a range of career opportunities in the rapidly evolving field of computer applications. Through a combination of theoretical and practical coursework, students will gain proficiency in programming, database management, software development, web design, Data Science, Artificial Intelligence, Cloud computing and other relevant areas.

## **Vision:**

To empower and inspire the students with the knowledge, skills, and values needed to drive innovation, solve complex problems, and contribute to the betterment of society.

## **Mission:**

- To provide a transformative learning experience that equips students with the knowledge, skills, and values needed to excel in the field of computer science.
- To foster a culture of innovation, collaboration, and critical thinking that prepares students for the challenges of a rapidly evolving technological landscape.

## **Program Educational Objectives**

PEO1: To prepare the graduates for successful careers in IT industry, by developing their ability to solve computing problems in multidisciplinary environment.

PEO2: To develop ability among the graduates to analyze data and technical concepts for various application development of real-life.

PEO3: To Motivate and provide graduates various opportunities for further studies, team work and successful career in their chosen domain.

PEO4: To motivate and encourage graduates to understand their social, ethical and cultural responsibilities as well with their professional responsibilities.

## **Program Specific Outcomes**

On completion of BCA (Honours) Four Year Degree Programme, the expected programme outcomes are the following:

PSO1: Develop software solutions for real-world problems using appropriate programming languages, algorithms, data structures , recent programming languages and trends like artificial intelligence , data science and cloud computing.

PSO2: Design and implement database systems using modern database management tools and techniques.

PSO3: Analyze and evaluate software development processes to identify areas for improvement and optimize performance using software testing principles.

PSO4: Demonstrate knowledge of basic concepts, principles, and terminologies related to cybersecurity, implement various security controls and measures to protect computer systems, networks, and data tools and manage firewalls, intrusion detection systems.

PSO5: Develop IOT solutions by integrating hardware, software, network components and implement data analytics in IoT Applications.

PSO6: Pursue lifelong learning and professional development by engaging in research, continuing education, and other learning opportunities beyond the classroom.

### Credit Structure of BCA (Science) (Honours Degree)

Sr. No.	Nature of Courses	Semesters( Credits)								Total Credits
		I	II	III	IV	V	VI	VII	VII I	
1	Major Discipline Core (DSC)/Department/ Subject Specific Course	6	6	8	8	10+ 4= 14	10 +4 = 14	14+ 4= 18	14+ 4= 18	76+16= 92
2	Minor	-	2	4	4	4	4	4	-	18+4=22
3	GE/OE or Generic/ Open Elective Course	4	4	2	2	-	-	-	-	12
4	Vocational Major	2	2	2	-	2	-	-	-	8
5	Skill Enhancement Course(SEC)	2	2	-	2	-	-	-	-	6
6	Ability Enhancement Courses(AECC)	2	2	2	2	-	-	-	-	8
7	IKS	2	-	-	-	-	-	-	-	2
8	Value Education	2	2	-	-	-	-	-	-	4
9	Co-curricular Courses	2	2	2	2	-	-	-	-	8
10	Field Projects/Internship /Projects/Community Engagement/	-	-	2	2	2	4	-	4	14
<b>Sub Total</b>		<b>22</b>	<b>22</b>	<b>22</b>	<b>22</b>	<b>22</b>	<b>22</b>	<b>22</b>	<b>22</b>	<b>176</b>

SEMESTER I					
Course Type	Course Code	Course Name	Credits		Total
			Theory	Practical	
Major/Core Theory	23SBCA11MM	Basic C Programming	2		
Major/Core Theory	23SBCA12MM	Database Management Systems	2		
Major/Core Practical	23SBCA13MM	Lab I - Basic C Programming		2	
GE/OE	23ABPS11OE	Introduction to Psychology	4		
Vocational Skill Course	23SBCA11VS	Fundamentals of Computers	2		
SEC	23SBCA11SE	Lab II - Database Management System		2	
AECC	23ABEN11AE	Functional English	2		
IKS	23ABHS11IKA	Indian Nuministics	2		
Value Education	23ABPO11VE	Democracy ,Election and Governance	2		
Co-Curricular Courses	23SBEV11CC	Health and Nutrition	2		
			18	4	

SEMESTER II					
Course Type	Course Code	Course Name	Credits		Total
			Theory	Practical	
Major/Core Theory	23SBCA21MM	Advanced C Programming	2		
Major/Core Theory	23SBCA22MM	Advanced Relational Database Management System	2		
Major/Core Practical	23SBCA23MM	Lab I : Advanced C Programming		2	
Minor	23SBCA21MN	Applied Mathematics	2		
GE/OE	23ABPS21OE	Social and Emotional Intelligence	4		
Vocational Skill Course	23SBCA21VS	Lab II: Advanced Database Management System		2	
SEC	23SBCA21SE	Fundamental of Digital Marketing	2		
AECC	23ABEN21AE	Functional English	2		
Value Education	23SBEV21VE	Environment Ethics and Values	2		
Co-Curricular Courses	23SBPE21CC	Physical Education ,Sports and Yoga	2		
			18	4	

## Format for Minor Subjects Semester wise

Sr. No.	Name of The Minor	SEM II	SEM III	SEM IV	SEM V	SEM VI
1	Cyber Security	Applied Mathematics	Computer Organization  Lab on Computer Organization	Introduction to Cyber Security  Lab on cyber security	Ethical Hacking and Penetration Testing  Lab on Ethical Hacking and Penetration Testing	Digital Forensics  Lab on Digital Forensics
2	Internet of things (IOT)	Applied Mathematics	Computer Organization  Lab on Computer Organization	Micro Controller and Programming  Lab on Micro Controller and Programming	Raspberry Pi and Applications  Lab on Raspberry Pi and Applications	Internet of things (IOT)  Lab on Internet of things (IOT)

# **SEMESTER-I**



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**F.Y.B.C.A (Science) SEM I (CBCS– Autonomy 2023 Pattern)**

<b>Course Title</b>	<b>BASIC C PROGRAMMING</b>	
<b>Course Code:23BCA11MM</b>		<b>No. Of Credits:02</b>
<b>Course Type: MM(Major Mandatory)</b>		<b>Total Teaching Hours:30</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	To provide a broad overview of problem solving techniques.
<b>2.</b>	To gain a thorough understanding of the fundamentals of C programming
<b>3.</b>	To write a code, compile and test C programs.
<b>4.</b>	To develop the logical ability for solving the real world problems.

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Define algorithms and flowchart on real case studies
<b>2.</b>	Understand features and applications of C language
<b>3.</b>	Explain use of appropriate data types, operators and Input Output statements
<b>4.</b>	Apply the concept of Decision making and Control Statements.
<b>5.</b>	Demonstrate ability to use top-down program design using functions

<b>Unit No</b>	<b>Title with Contents</b>	<b>No. of Lectures</b>
<b>Unit I</b>	<b>Programming Languages and Problem Solving Techniques</b>	<b>04</b>
	<b>1.Introduction</b> i. Computer Hardware ii. Computer Software iii. System Software iv. Application Software	<b>1</b>
	<b>2.Computer Languages</b> i. Machine Language ii. Assembly Language iii. High Level Language iv. Compilers and Interpreters	<b>1</b>
	<b>3.Algorithms</b> i. Definition and Characteristics of Algorithm ii. Advantages and Disadvantages of Algorithm iii. Examples of Algorithms	<b>1</b>
	<b>4.Flowchart</b>	<b>1</b>
<b>Unit II</b>	<b>Introduction to C Language</b>	<b>01</b>
	<b>1. History</b> <b>2. Features of C</b> <b>3. Limitations of C</b> <b>4. Application Areas</b> <b>5. Structure of C Program</b> <b>6. Sample C Program</b>	<b>1</b>
<b>Unit III</b>	<b>C Tokens and Input Output</b>	<b>09</b>
	<b>1. C Character Set</b> i. Identifiers ii. Keywords iii. Variables iv. Constants	<b>2</b>
	<b>2. Data types</b> i. Basic data types ii. Enumerated types	<b>2</b>

	<ul style="list-style-type: none"> <li>iii. Type casting</li> <li>iv. Declarations</li> </ul> <p><b>3. Expressions</b></p> <p><b>4. Operators</b></p> <ul style="list-style-type: none"> <li>i. Unary Operators</li> <li>ii. Binary Operators</li> <li>iii. Arithmetic Operators</li> <li>iv. Increment Decrement Operators</li> <li>v. Relational Operator</li> <li>vi. Logical operators</li> <li>vii. Bit wise Operators</li> <li>viii. Assignment Operators</li> <li>ix. Comma Operator</li> <li>x. size of operator</li> <li>xi. Ternary conditional operator</li> <li>xii. Precedence and associativity</li> </ul> <p><b>5. Format specifier, printf, scanf functions</b></p> <p><b>6. getchar, putchar, getch functions</b></p> <p><b>7. gets, puts functions</b></p> <p><b>8. Escape sequence characters</b></p>	<p>1</p> <p>2</p> <p>1</p> <p>1</p>
<b>Unit IV</b>	<b>Control and Iterative Structures</b>	<b>06</b>
	<p><b>1. If, If- Else Statements, Nested If Statements</b></p> <p><b>2. Conditional Branching</b></p> <ul style="list-style-type: none"> <li>i. Switch statement</li> </ul> <p><b>3. Loops</b></p> <ul style="list-style-type: none"> <li>i. For</li> <li>ii. While</li> <li>iii. do...while</li> </ul> <p><b>4. break, continue, goto statements</b></p> <p><b>5. Program</b></p>	<p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p>
<b>Unit V</b>	<b>Functions</b>	<b>05</b>
	<p><b>1. Introduction to Functions and Function Arguments</b></p> <p><b>2. Library and User defined functions</b></p> <p><b>3. Methods for parameter passing</b></p> <p><b>4. Recursion</b></p> <p><b>5. Storage Classes</b></p> <ul style="list-style-type: none"> <li>i. Auto</li> <li>ii. Static</li> </ul>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>

	iii. Global iv. Register	<b>1</b>
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<b>Suggested Reading</b>		
1.	B.W.Kerninghan and D. M.Ritchie,“The C Programming Language”(Second Edition),BPB Publication	
2.	Fundamentals of Relational Database Management Systems - S. Sumathi and S. Esakkirajan, Springer Berlin Heidelberg New York, ISBN-13 978-3-540-48397-7	
3.	YSKanetkar,“Let Us C”,O’ Rreilly Publication	
4.	Cormen,Leiserson,Rivest,Stein,“Introductiontoalgorithms”,O’ReillyPublication	
5.	Herbert Schildt, “C CompleteReference”,McGrawHillEducation,4thEdition	
6.	BehrouzForouzan and RichardGilberg,“AstructuredProgrammingApproachusingC”O’ReillyPublication	
<b>Website Reference Link:</b>		
1.	C Programming – C Tutorial-Tutorials Point.com <a href="https://www.tutorialspoint.com/cprogramming/">https://www.tutorialspoint.com/cprogramming/</a>	
2.	Learn C Programming : <a href="https://www.programiz.com/c-programming">https://www.programiz.com/c-programming</a>	
3.	C Tutorial-LearnC: <a href="https://www.cprogramming.com/tutorial/c-tutorial.html">https://www.cprogramming.com/tutorial/c-tutorial.html</a>	
4.	Head First C: <a href="https://www.pdfdrive.com/head-first-c-e19540108.html">https://www.pdfdrive.com/head-first-c-e19540108.html</a>	
<b>Best IDE Tools:</b>		
Sr.No	Name of IDE or Tools	Operating System
1	TurboC3.0onwards	Window Operating System
2	ViEditor/GEdit8.2 onwards and C compiler	Red Hat/Linux/Ubuntu



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**F.Y.B.C.A (Science) SEMI I (CBCS– Autonomy 2023 Pattern)**

<b>Course Title</b>	<b>DATABASE MANAGEMENT SYSTEM</b>	
<b>Course Code:23SBCA12MM</b>		<b>No. Of Credits:02</b>
<b>Course Type: MM(Major Mandatory)</b>		<b>Total Teaching Hours:30</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	To understand the fundamental concepts of database management such as database design, database languages, and database-system implementation
<b>2.</b>	To study and understand systematic database design approaches
<b>3.</b>	To learn SQL – the database Query language

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Know the users and application areas of DBMS
<b>2.</b>	Design E-R Model for given requirements and convert the same into database tables.
<b>3.</b>	Formulate constraints on tables
<b>4.</b>	Construct database queries using SQL
<b>5.</b>	Normalize a database in 3NF format

<b>Unit No</b>	<b>Title with Contents</b>	<b>No.of Lectures</b>
<b>Unit I</b>	<b>Introduction of DBMS</b>	<b>02</b>
	<ol style="list-style-type: none"> <li>1. Overview</li> <li>2. Level of abstraction</li> <li>3. Structure of DBMS</li> <li>4. Users of DBMS</li> </ol>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p>
<b>Unit II</b>	<b>Conceptual Design (E-R model)</b>	<b>06</b>
	<ol style="list-style-type: none"> <li>1. Overview of DB design</li> <li>2. ER data model               <ol style="list-style-type: none"> <li>i. Entities</li> <li>ii. weak entities</li> <li>iii. attributes</li> <li>iv. entity sets</li> <li>v. relations</li> <li>vi. relationship sets</li> </ol> </li> <li>3. Aggregation and Generalization</li> <li>4. Case studies</li> </ol>	<p style="text-align: center;">1</p> <p style="text-align: center;">2</p> <p style="text-align: center;">2</p> <p style="text-align: center;">1</p>
<b>Unit III</b>	<b>Structure of Relational Databases</b>	<b>05</b>
	<ol style="list-style-type: none"> <li>1. Key Features Of Relational Database               <ol style="list-style-type: none"> <li>i. Table</li> <li>ii. Row</li> <li>iii. Relation</li> <li>iv. Tuple</li> <li>v. Key</li> </ol> </li> <li>2. Conversion of ER to Relational model with example</li> <li>3. Integrity constraints               <ol style="list-style-type: none"> <li>i. Primary key</li> <li>ii. Referential Integrity</li> <li>iii. Null constraint</li> <li>iv. Unique constraint</li> <li>v. Check constraint</li> </ol> </li> </ol>	<p style="text-align: center;">1</p> <p style="text-align: center;">2</p> <p style="text-align: center;">2</p>
<b>Unit IV</b>	<b>Structured Query Language</b>	<b>12</b>
	<ol style="list-style-type: none"> <li>1. Introduction</li> <li>2. DDL commands with examples               <ol style="list-style-type: none"> <li>i. create</li> <li>ii. drop</li> <li>iii. alter</li> <li>iv. Truncate</li> </ol> </li> <li>3. DML commands with examples</li> </ol>	<p style="text-align: center;">2</p> <p style="text-align: center;">2</p>

	<ul style="list-style-type: none"> <li>i. Insert</li> <li>ii. Update</li> <li>iii. Delete</li> </ul> <p><b>4. Basic structure of SQL query</b></p> <p><b>5. Set operations</b></p> <p><b>6. Aggregate functions</b></p> <p><b>7. Nested Sub-queries</b></p> <p><b>8. SQL Joins and their types</b></p> <p><b>9. Examples on SQL (case studies)</b></p>	<p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
<b>Unit V</b>	<b>Relational Database Design</b>	<b>5</b>
	<p><b>1. Functional dependencies</b></p> <ul style="list-style-type: none"> <li>i. Inference Rules</li> <li>ii. Closure of set of functional dependencies</li> <li>iii. Closure of an Attribute set</li> </ul> <p><b>2. Concept of Normalization</b></p> <ul style="list-style-type: none"> <li>i. Definition</li> <li>ii. 1NF</li> <li>iii. 2NF</li> <li>iv. 3NF</li> </ul> <p><b>3. Examples on Normalization</b></p>	<p>2</p> <p>2</p> <p>1</p>

<b>Suggested Reading</b>	
<b>1.</b>	Database System Concepts, Henry F. Korth, Abraham Silberschatz, S.Sudarshan, Tata McGraw-Hill Education, ISBN:9780071289597
<b>2.</b>	Fundamentals of Relational Database Management Systems - S. Sumathiand S. Esakkirajan, Springer Berlin Heidelberg New York, ISBN-13 978-3-540-48397-7
<b>3.</b>	Beginning Databases with PostgreSQL: From Novice to Professional, Richard Stones, Neil Matthew, Apress, Second Edition, ISBN: 9781590594780
<b>4.</b>	Database Management Systems ,Raghu Ramakrishna, McGraw-Hill, Second Edition, ISBN:978007125434
<b>5.</b>	Database Systems, Shamkant B. Navathe, RamezElmasri, PEARSON, ISBN:9780132144988
<b>6.</b>	An introduction to Database systems, Bipin C Desai, Galgotia Publications
<b>Website Reference Link:</b>	
<b>1.</b>	<a href="https://www.geeksforgeeks.org/dbms/">https://www.geeksforgeeks.org/dbms/</a>
<b>2.</b>	<a href="https://www.javatpoint.com/dbms-examples">https://www.javatpoint.com/dbms-examples</a>
<b>3.</b>	<a href="https://www.youtube.com/watch?v=79MOa6STZAc">https://www.youtube.com/watch?v=79MOa6STZAc</a>
<b>4.</b>	<a href="https://www.techtarget.com/searchdatamanagement/definition/database-management-system">https://www.techtarget.com/searchdatamanagement/definition/database-management-system</a>

<b>Best IDE Tools:</b>		
<b>Sr.No</b>	<b>Name of IDE or Tools</b>	<b>Operating System</b>
1	Postgresql 11.0 onwards	Window Operating System
2	Postgresql 11.0 onwards	Red Hat /Linux / Ubuntu



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**F.Y.B.C.A (Science) SEM I (CBCS– Autonomy 2023 Pattern)**

<b>Course Title</b>	<b>LAB I : BASIC C PROGRAMMING</b>	
<b>Course Code: 23SBCA13MM</b>		<b>No. Of Credits:02</b>
<b>Course Type: MM(Major Mandatory)</b>		<b>Total Teaching Hours:60</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
1.	To learn formulation of algorithm for a given problem
2.	To study various data types, arrays and functions in C
3.	To understand input-output and, control and iterative statements in C
4.	To learn advanced features in C Programming
5.	To study advanced data types
6.	To understand built-in library functions

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
1.	Formulate an algorithm and draw flowchart for the given problem
2.	Implement the given algorithm in C
3.	Write programs using appropriate data types and control structures in C

<b>Assignment No</b>	<b>Assignment Name</b>	<b>No. Of Sessions</b>
1.	Assignment on input output statements	3
2.	Assignment on Decision Making Statement	3
3.	Assignment on Control Structures Iterative Structures	3
4.	Assignment on Functions	3
5.	Assignment on Recursive Function	2
<b>Total Number of Sessions</b>		<b>14</b>

## Guidelines for Student Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and **hand written write-up** of each assignment (Title, Problem Statement, Outcomes, Date of Completion, Assessment grade/marks and assessor's sign. Program codes with sample output of all performed assignments are to be submitted as soft copy.

## Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on the overall performance of students. For each lab assignment, the instructor will assign grade/marks based on parameters with appropriate weightage. Suggested parameters include- timely completion, performance, innovation, efficient codes, punctuality and neatness

## Best IDE Tools:

Sr. No	Name of IDE or Tools	Operating System
1	TurboC3.0onwards	Window Operating System
2	Vi Editor/GEdit8.2onwardsand C compiler	Red Hat/Linux/Ubuntu



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<b>Course Title</b>	<b>COMPUTER FUNDAMENTAL</b>	
<b>Course Code: 23SBCA11VS</b>		<b>No. Of Credits:02</b>
<b>Course Type: (VSC)Vocational Skill Course</b>		<b>Total Teaching Hours:60</b>

<b>Sr. No.</b>	<b>Course Objectives</b>
1.	To study the basics of Computer System
2.	To learn how to configure computer devices
3.	To Learn Basic Commands of Operating system and application software
4.	To understand Open Source Software

<b>Sr. No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
1.	Define working of computers and peripherals, types of software and languages
2.	Troubleshoot the computer systems and use utility software
3.	Choose commands and features of operating systems and application software
4.	Use open source software



	<b>iii. Components of Motherboard</b>	
	<p><b>2. Register Memory</b></p> <ul style="list-style-type: none"> <li>i. Types</li> <li>ii. Functions of Computer Register</li> </ul> <p><b>3. Cache Memory</b></p> <p><b>4. Primary Memory</b></p> <ul style="list-style-type: none"> <li>i. RAM</li> <li>ii. ROM</li> <li>iii. PROM</li> <li>iv. EPROM</li> </ul> <p><b>5. Secondary Storage Devices</b></p> <ul style="list-style-type: none"> <li>i. HDD</li> <li>ii. SSD</li> </ul> <p><b>6. I/O Devices</b></p> <ul style="list-style-type: none"> <li>i. Scanners</li> <li>ii. Digitizers</li> <li>iii. Plotters</li> <li>iv. LCD</li> <li>v. Plasma Display</li> </ul> <p><b>7. Introduction to Network devices</b></p> <ul style="list-style-type: none"> <li>i. Hubs</li> <li>ii. Switches</li> <li>iii. Routers</li> <li>iv. NAS</li> <li>v. MODEM</li> <li>vi. Access Points</li> <li>vii. Various cables.</li> </ul>	<p>1</p> <p>2</p> <p>2</p>
<b>Unit III</b>	<b>Computer Software</b>	<b>06</b>
	<p><b>1. Types of Software</b></p> <ul style="list-style-type: none"> <li>i. System Software</li> <li>ii. Application Software</li> </ul> <p><b>2. Operating System</b></p> <ul style="list-style-type: none"> <li>i. Types of Operating System</li> <li>ii. Functions of Operating System</li> </ul> <p><b>3. Utility Programs</b></p> <ul style="list-style-type: none"> <li>i. Anti-plagiarism software</li> </ul>	<p>2</p> <p>1</p>

	<ul style="list-style-type: none"> <li>ii. Disk Cleaning</li> <li>iii. Defragmentation</li> </ul>	
	<p><b>4. Application Software</b></p> <ul style="list-style-type: none"> <li>i. Dropbox,</li> <li>ii. Git</li> <li>iii. Jenkins</li> </ul> <p><b>5. Linux Commands</b></p> <ul style="list-style-type: none"> <li>i. Sudo</li> <li>ii. Ls</li> <li>iii. Pwd</li> <li>iv. cat etc.</li> </ul>	<p style="text-align: center;"><b>1</b></p> <p style="text-align: center;"><b>2</b></p>
<b>Unit IV</b>	<b>Open Source Software</b>	<b>08</b>
	<p><b>1. Introduction</b></p> <ul style="list-style-type: none"> <li>i. Open Source</li> <li>ii. Free Software</li> <li>iii. Free Software vs. Open Source software</li> </ul> <p><b>2. Open Source Operating Systems</b></p> <ul style="list-style-type: none"> <li>i. GNU/Linux</li> <li>ii. Android</li> </ul> <p><b>3. Development tools</b></p> <ul style="list-style-type: none"> <li>i. IDE (Visual Studio and Eclipse)</li> <li>ii. LAMP</li> </ul> <p><b>4. Open Source Projects</b></p> <ul style="list-style-type: none"> <li>i. GNU/Linux</li> <li>ii. Wikipedia</li> <li>iii. Word press</li> <li>iv. GCC</li> <li>v. Git hub</li> <li>vi. Open Office.</li> </ul> <p><b>5. Editors</b></p> <ul style="list-style-type: none"> <li>i. Notepad++</li> <li>ii. Vi</li> <li>iii. Emacs</li> <li>iv. Gedit and Kate</li> <li>v. Difference between Word</li> <li>vi. Processor/Editors and IDE.</li> </ul> <p><b>6. Presentation Tools</b></p> <ul style="list-style-type: none"> <li>i. Libre Office Impress.</li> </ul> <p><b>7. Introduction to Google Apps</b></p> <ul style="list-style-type: none"> <li>i. Google Docs</li> <li>ii. Google Sheets</li> </ul>	<p style="text-align: center;"><b>1</b></p>

	iii. Google Forms iv. Applications	
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<b>Suggested Reading</b>	
<b>1.</b>	P.K. Sinha and Priti Sinha, “Computer Fundamentals”, 3rd Edition, BPB Pub
<b>2.</b>	John Walkenbach, Michael Alexander and Richard Kusleika, “Excel 2019 Bible”, Wiley Publication.
<b>3.</b>	Steven Roman, “Writing Excel Macros with VBA”, O’Reilly Publication
<b>4.</b>	Sumitabha Das, “Unix Concepts and Applications”, Tata McGraw Hill Education
<b>5.</b>	Join Josh, “PC/HARDWARE”, O’Reilly Publication

<b>Website Reference Link:</b>	
<b>1.</b>	Open Source Initiative: <a href="https://opensource.org/">https://opensource.org/</a>
<b>2.</b>	Wikipedia, the free encyclopedia : <a href="https://en.wikipedia.org/">https://en.wikipedia.org/</a>
<b>3.</b>	GitHub Documentation : <a href="https://help.github.com/">https://help.github.com/</a>
<b>4.</b>	libreofficehelp.com - Quick Tutorials, Solutions and to the point: <a href="https://www.libreofficehelp.com">https://www.libreofficehelp.com</a>
<b>5.</b>	Tutorials point-Ubuntu : <a href="https://www.tutorialspoint.com/ubuntu/ubuntu_libreoffice.html">https://www.tutorialspoint.com/ubuntu/ubuntu_libreoffice.html</a>



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**F.Y.B.C.A (Science) SEM I (CBCS– Autonomy 2023 Pattern)**

<b>Course Title</b>	<b>LAB II: DATABASE MANAGEMENT SYSTEM</b>	
<b>Course Code: 23SBCA11SE</b>		<b>No. Of Credits:02</b>
<b>Course Type: SEC(Skill Enhancement Course)</b>		<b>Total Teaching Hours:60</b>

<b>Sr.No.</b>	<b>Course Objectives</b>
1.	Prepare E-R Diagram for the given problem statement
2.	Formulate appropriate SQL DDL Queries
3.	Formulate appropriate SQL DML Queries

<b>Sr.No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
1.	Prepare E-R Diagram for the given problem statement
2.	Formulate appropriate SQL DDL Queries using create, drop commands
3.	Formulate appropriate SQL DML Queries using insert, update, delete commands
5.	Use aggregate functions like Max, Min, Sum
6.	Write nested queries

<b>Assignment No</b>	<b>Assignment Name</b>	<b>No. of Sessions</b>
1.	To create simple tables, with only the primary key constraint	2
2.	To create more than one table, with various constraints like referential integrity constraint, PK constraint, Check constraint, Unique constraint and Not null constraint	2
3.	To drop a table from the database, to alter the schema of a table in the Database.	2
4.	To insert, update and delete records using tables created in previous Assignments.	2
5.	Queries using Aggregate function, Group by clause, Order by clause, Having clause and queries on join	3
6.	Queries using set operations (union, intersect)	3
		<b>14</b>

## Guidelines for Student Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and **hand written write-up** of each assignment (Title, Problem Statement, Outcomes, Date of Completion, Assessment grade/marks and assessor's sign. Program codes with sample output of all performed assignments are to be submitted as soft copy.

## Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on the overall performance of students. For each lab assignment, the instructor will assign grade/marks based on parameters with appropriate weightage. Suggested parameters include- timely completion, performance, innovation, efficient codes, punctuality and neatness

### Best IDE Tools:

Sr.No	Name of IDE or Tools	Operating System
1	Postgresql 11.0 onwards	Window Operating System
2	Postgresql 11.0 onwards	Red Hat /Linux / Ubuntu

# **SEMESTER – II**



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**F.Y.B.C.A (Science) SEM II (CBCS– Autonomy 2023 Pattern)**

<b>Course Title</b>	<b>ADVANCED C PROGRAMMING</b>	
<b>Course Code: 23BCA21MM</b>		<b>No. of Credits:02</b>
<b>Course Type: MM (Major Mandatory)</b>		<b>Total Teaching Hours:30</b>

<b>Course Objectives</b>	
<b>1.</b>	To provide abroad overview of problem solving techniques.
<b>2.</b>	To write a code, compile and test C programs.
<b>3.</b>	To develop the logical ability for solving the real world problems.
<b>4.</b>	Implementing pointers
<b>5.</b>	File management and dynamic memory allocation

<b>Course Outcome</b>	
After completing course students will be able to -	
<b>1.</b>	Use of Arrays and Strings on various applications
<b>2.</b>	Repeat the sequence of instructions and points for a memory location
<b>3.</b>	Apply code reusability with functions and pointers
<b>4.</b>	Understand the basics of file handling mechanisms





<b>Best IDE Tools:</b>		
<b>Sr.No</b>	<b>Name of IDE or Tools</b>	<b>Operating System</b>
<b>1.</b>	TurboC3.0onwards	Window Operating System
<b>2.</b>	Vi Editor/GEdit8.2 onwards and C compiler	RedHat/Linux/Ubuntu



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**F.Y.B.C.A. (Science) SEM-II (CBCS – Autonomy 2023 Pattern)**

<b>Course Title</b>	<b>Advanced Relational Database Management System</b>	
<b>Course Code: 23SBCA22MM</b>		<b>No. of Credits:02</b>
<b>Course Type: MM (Major Mandatory)</b>		<b>Total Teaching Hours:30</b>

**Course Objectives**

1.	To study fundamental concepts of RDBMS (PL/PGSQL)
2.	To Learn Transaction and Concurrency Methods
3.	To Learn various database recovery techniques

**Course Outcome**

After completing course students will be able to -	
1.	Perform Database operations using PL/PostgreSQL.
2.	Understand Transaction Concepts and Concurrency Techniques
3.	Apply recovery techniques and access control mechanism



	<ul style="list-style-type: none"> <li>i. Deferred and Immediate update</li> </ul> <p><b>5. Access Control Method</b></p> <ul style="list-style-type: none"> <li>i. Discretionary access control method</li> <li>ii. Mandatory access control</li> <li>iii. Role based access control for multilevel security</li> </ul>	
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### Suggested Readings

1.	Database System Concepts, Henry F. Korth, Abraham Silberschatz, S.Sudarshan, Tata McGraw-Hill Education, ISBN:9780071289597
2.	Database Systems, Shamkant B. Navathe, Ramez Elmasri, PEARSON, ISBN:9780132144988
3.	An introduction to Database systems, Bipin C Desai, Galgotia Publications
4.	Database Management Systems ,Raghu Ramakrishna, McGraw-Hill, Second Edition, ISBN:9780071254342
5.	Beginning Databases with Postgre SQL: From Novice to Professional, Richard Stones, Neil Matthew, Apress, Second Edition, ISBN: 9781590594780
6.	Fundamentals of Relational Database Management Systems - S. Sumathi and S. Esakkirajan, Springer Berlin Heidelberg New York, ISBN-13 978-3-540-48397-7

### Website Reference Link

1.	CProgramming-CTutorial: <a href="https://www.tutorialspoint.com/cprogramming/">https://www.tutorialspoint.com/cprogramming/</a>
2.	Learn C Programming : <a href="https://www.programiz.com/c-programming">https://www.programiz.com/c-programming</a>
3.	CTutorial-LearnC: <a href="https://www.cprogramming.com/tutorial/c-tutorial.html">https://www.cprogramming.com/tutorial/c-tutorial.html</a>
4.	Head First C: <a href="https://www.pdfdrive.com/head-first-c-e19540108.html">https://www.pdfdrive.com/head-first-c-e19540108.html</a>

### Best IDE Tools:

Sr. No	Name of IDE or Tools	Operating System
1	Postgresql 11.0 onwards	Window Operating System
2	Postgresql 11.0 onwards	Red Hat /Linux / Ubuntu



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**F.Y.B.C.A. (Science) SEM-II (CBCS – Autonomy 2023 Pattern)**

<b>Course Title</b>	<b>LAB I :ADVANCED C PROGRAMMING</b>		
<b>Course Code: 23BCA23MM</b>		<b>No. of Credits:02</b>	
<b>Course Type: MM (Major Mandatory)</b>		<b>Total Teaching Hours:60</b>	

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	To understand built-in library functions
<b>2.</b>	To understand memory management
<b>3.</b>	To implement file handling operations
<b>4.</b>	To understand graphics concepts

<b>Sr.No.</b>	<b>Course Outcome</b>
	After completing course students will be able to -
<b>1.</b>	Write programs using pointers, structures and unions
<b>2.</b>	Use Preprocess or directives
<b>3.</b>	Manipulate strings using library functions
<b>4.</b>	Write programs to perform operations on Files

<b>Assignment No</b>	<b>Assignment Name</b>	<b>No. Of Sessions</b>
1.	<b>Assignment on Arrays and Strings</b>	<b>03</b>
2.	<b>Assignment on pointers and pointers with Array</b>	<b>03</b>
3.	<b>Assignment on Structures</b>	<b>03</b>
4.	<b>Assignment on Union</b>	<b>02</b>
5.	<b>Assignment on File Handling</b>	<b>03</b>
<b>Total Number of Sessions</b>		<b>14</b>

## Guidelines for Student Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and **hand written write-up** of each assignment (Title, Problem Statement, Outcomes, Date of Completion, Assessment grade/marks and assessor's sign. Program codes with sample output of all performed assignments are to be submitted as soft copy.

## Guidelines for Assessment

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**F.Y.B.C.A. (Science) SEM-II (CBCS – Autonomy 2023 Pattern)**

<b>Course Title</b>	<b>APPLIED MATHEMATICS</b>	
<b>Course Code: 23SBCA21MN</b>		<b>No. of Credits:02</b>
<b>Course Type: MN (Minor)</b>		<b>Total Teaching Hours:30</b>

**Course Objectives**

1.	Learn basic terminology formal logic, sets, relations, functions and perform the operations associated with same.
2.	Use formal logic proof and logical reasoning to solve problems.
3.	To acquaint students with some basic concepts in Mathematics.

**Course Outcome**

After completing course students will be able to -	
1.	Relate and apply techniques for constructing mathematical proofs and make use of appropriate set operations, propositional logic to solve problems.
2.	Use function or relation models to interpret associated relationships.
3.	Understand various types of matrices and operations on matrices

<b>Unit No</b>	<b>Title with Contents</b>	<b>No. of Lectures</b>
<b>Unit I</b>	<b>Set Theory, Logic and functions</b>	<b>10</b>
	<b>1. Propositional Logic.</b>	2
	<b>2. Propositional Equivalences.</b>	2
	<b>3. Sets.</b>	2
	<b>4. Set Operations.</b>	2
	<b>5. Functions.</b>	2
<b>Unit II</b>	<b>Relations and Graphs</b>	<b>10</b>
	<b>1. Relations and their properties.</b>	1
	<b>2. n- ary Relations and their applications.</b>	1
	<b>3. Representing Relations.</b>	1
	<b>4. Closure of Relations</b>	1
	<b>5. Equivalence Relations.</b>	1
	<b>6. Partial Orderings.</b>	1
	<b>7. Graphs and Graph Models.</b>	1
	<b>8. Graph Terminology and Special Graphs.</b>	1
	<b>9. Representing Graphs.</b>	1
	<b>10. Connectivity.</b>	1
<b>Unit III</b>	<b>Linear Equations and Matrices</b>	<b>10</b>
	<b>1. Linear systems</b>	2
	<b>2. Matrices Dot Product and Matrix Multiplication</b>	2
	<b>3. Matrix Transformations</b>	2
	<b>4. Solutions of Linear Systems of Equations</b>	2
	<b>5. LU- Factorization.</b>	2

<b>Suggested Readings</b>	
1.	KENNETH H ROSEN (Indian Adaptation by Kamala Krithivasan), Discrete Mathematics and Its Application with Combinatorics and Graph Theory, Seventh Edition, Special Indian Edition, McGraw Hill Education (India) Private Limited Unit I: Chapter 1: Sec. 1.1, 1.2., Chapter 2: Sec. 2.1, 2.2, 2.3. Unit II: Chapter 7: Sec. 7.1, 7.2, 7.3, 7.4, 7.5, 7.6. Chapter 8: Sec. 8.1, 8.2, 8.3 (Only Representing Graphs), 8.4.
2.	B. Kolman , D. Hill, Introductory Linear Algebra, An Applied First Course, Pearson Edn; 8th Edn; (2008) Unit III: Chapter : 1
3.	Bernard Kolman, Robert C. Busy, Sharon Cutler Ross, Discrete Mathematical Structures, Sixth Edition, PHI Learning Private Limited.
4.	H. Anton, Chris Rorres, Linear Algebra with Applns., Wiley, 7th Edn; (1994)
<b>Website Reference Link</b>	
1.	<a href="https://onlinecourses.nptel.ac.in/noc20_cs82/preview">https://onlinecourses.nptel.ac.in/noc20_cs82/preview.</a>



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**F.Y.B.C.A (Science) SEM II (CBCS– Autonomy2023Pattern)**

<b>Course Title</b>	<b>Lab: II ADVANCED DATABASE MANAGEMENT SYSTEM</b>	
<b>Course Code:23SBCA21VS</b>	<b>No. Of Credits:02</b>	
<b>Course Type: VS (Vocational Skill Course)</b>	<b>Total Teaching Hours:60</b>	

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	To study fundamental concepts of RDBMS (PL/PGSQL)
<b>2.</b>	To learn concept of function, cursor, trigger

<b>Sr. No.</b>	<b>Course Outcome</b>
After completing course students will be able to -	
<b>1.</b>	Formulate SQL queries using advanced SQL features.
<b>2.</b>	Write PL/PgSQL block code and function
<b>3.</b>	Apply trigger and cursor on the table
<b>4.</b>	Handle the run time exceptions

<b>Assignment No</b>	<b>Assignment Name</b>	<b>No. of Sessions</b>
<b>1.</b>	To create a view for composite or complex queries.	<b>2</b>
<b>2.</b>	To insert, update and delete records by using functions, cursors and triggers.	<b>2</b>
<b>3.</b>	Use the exception handling mechanism for the queries.	<b>2</b>
<b>4.</b>	To insert, update and delete records using tables created in previous Assignments.	<b>2</b>
<b>5.</b>	Queries using Aggregate function, Group by clause, Order by clause, Having clause and queries on join	<b>3</b>
<b>6.</b>	Queries using set operations (union, intersect)	<b>3</b>
<b>TOTAL</b>		<b>14</b>

## Guidelines for Student Journal

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**F.Y.B.C.A (Science) SEM II (CBCS– Autonomy2023Pattern)**

<b>Course Title</b>	<b>FUNDAMENTALS OF DIGITAL MARKETING</b>	
<b>Course Code: 23SBCA21SE</b>	<b>No. Of Credits:02</b>	
<b>Course Type: SEC(Skill Enhancement Course)</b>	<b>Total Teaching Hours:30</b>	

<b>Sr.No.</b>	<b>Course Objectives</b>
<b>1.</b>	It will provide an introduction to the fundamental concepts, tools, and techniques used in digital marketing.
<b>2.</b>	Students will learn how to develop and implement effective digital marketing strategies and campaigns.
<b>3.</b>	Students will learn how to analyze and optimize their performance.

<b>Sr.No.</b>	<b>Course Outcome</b>
After completion of course students will be able to-	
<b>1.</b>	Understand the fundamental concepts and principles of digital marketing
<b>2.</b>	Develop and implement digital marketing strategies and campaigns.
<b>3.</b>	Analyze and optimize the performance of digital marketing campaigns.
<b>4.</b>	Apply digital marketing tools and techniques effectively
<b>5.</b>	Communicate effectively about digital marketing topics

<b>Unit No</b>	<b>Title with Content</b>	<b>No. of Lectures</b>
<b>Unit I</b>	<b>Introduction to Digital Marketing</b>	<b>04</b>
	1. Overview of digital marketing concepts, tools, and techniques	2
	2. Importance of digital marketing in today's business environment	1
	3. Trends and future of digital marketing	1
<b>Unit II</b>	<b>Search Engine Optimization (SEO)</b>	<b>05</b>
	1. Principles and practices of SEO	2
	2. Keyword research and selection	1
	3. On-page and off-page optimization	1
	4. Link building strategies	1
<b>Unit III</b>	<b>Pay-Per-Click (PPC) Advertising</b>	<b>05</b>
	1. Principles and practices of PPC advertising	1
	2. Google Ads and other PPC platforms	2
	3. Keyword selection and bidding	1
	4. Ad creation and optimization	1
<b>Unit IV</b>	<b>Social Media Marketing</b>	<b>04</b>
	1. Principles and practices of social media marketing	1
	2. Choosing the right social media platforms	1
	3. Creating effective social media content	1
	4. Measuring social media performance	1
<b>Unit V</b>	<b>Email Marketing</b>	<b>04</b>
	1. Principles and practices of email marketing	1
	2. Creating effective email campaigns	1
	3. Measuring email campaign performance	1
	4. Building email subscriber lists	1
<b>Unit VI</b>	<b>Email Marketing</b>	<b>04</b>
	1. Principles and practices of email marketing	1
	2. Creating effective email campaigns	1
	3. Measuring email campaign performance	1
	4. Building email subscriber lists	1
<b>Unit VII</b>	<b>Web Analytics</b>	<b>04</b>
	1. Principles and practices of web analytics	1
	2. Setting up Google Analytics	1
	3. Analyzing and interpreting web analytics data	1
	4. Optimizing digital marketing campaigns based on web analytics data	1

<b>Suggested Readings</b>	
1.	Digital Marketing Fundamentals, by Marjorie D. Moore (2019)
2.	Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World, by Chuck Hemann and Ken Burbary (2017).
3.	The Art of SEO: Mastering Search Engine Optimization, by Eric Enge, Stephan Spencer, and Jessie Stricchiola (2020)

<b>Website Reference Link:</b>	
1	Google Analytics Academy: <a href="https://analytics.google.com/analytics/academy">https://analytics.google.com/analytics/academy</a>
2	Hubspot Academy: <a href="https://academy.hubspot.com/courses">https://academy.hubspot.com/courses</a>
3	Hootsuite Academy: <a href="https://education.hootsuite.com/courses">https://education.hootsuite.com/courses</a>