



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		
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
Sub Total		22	22	22	22	22	22	22	176	

SEMESTER I					
Course Type	Course Code	Course Name	Credits		
			Theory	Practical	Total
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	22

SEMESTER II					
Course Type	Course Code	Course Name	Credits		
			Theory	Practical	Total
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	22

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)

Course Title	BASIC C PROGRAMMING	
Course Code: 23SBCA11MM	No. Of Credits: 02	
Course Type: MM(Major Mandatory)		Total Teaching Hours: 30

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

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

Unit No	Title with Contents	No. of Lectures
Unit I	Programming Languages and Problem Solving Techniques	04
	1. Introduction <ul style="list-style-type: none"> i. Computer Hardware ii. Computer Software iii. System Software iv. Application Software 2. Computer Languages <ul style="list-style-type: none"> i. Machine Language ii. Assembly Language iii. High Level Language iv. Compilers and Interpreters 3. Algorithms <ul style="list-style-type: none"> i. Definition and Characteristics of Algorithm ii. Advantages and Disadvantages of Algorithm iii. Examples of Algorithms 4. Flowchart	1 1 1 1
Unit II	Introduction to C Language	01
	1. History 2. Features of C 3. Limitations of C 4. Application Areas 5. Structure of C Program 6. Sample C Program	1
Unit III	C Tokens and Input Output	09
	1. C Character Set <ul style="list-style-type: none"> i. Identifiers ii. Keywords iii. Variables iv. Constants 2. Data types <ul style="list-style-type: none"> i. Basic data types ii. Enumerated types 	2 2

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

	iii. Global iv. Register	1
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Suggested Reading		
1.	B.W.Kernighan 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’ Reilly Publication	
4.	Cormen,Leiserson,Rivest,Stein,“Introductiontoalgorithms”,O'ReillyPublication	
5.	Herbert Schildt, “C CompleteReference”,McGrawHillEducation,4thEdition	
6.	BehrouzForouzan and RichardGilberg,“AstructuredProgrammingApproachusingC”O'ReillyPublication	
Website Reference Link:		
1.	C Programming – C Tutorial-Tutorials Point.com https://www.tutorialspoint.com/cprogramming/	
2.	Learn C Programming : https://www.programiz.com/c-programming	
3.	C Tutorial-LearnC: https://www.cprogramming.com/tutorial/c-tutorial.html	
4.	Head First C: https://www.pdfdrive.com/head-first-c-e19540108.html	
Best IDE Tools:		
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) SEM I (CBCS– Autonomy 2023 Pattern)

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

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

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

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

	i. Insert ii. Update iii. Delete 4. Basic structure of SQL query 5. Set operations 6. Aggregate functions 7. Nested Sub-queries 8. SQL Joins and their types 9. Examples on SQL (case studies)	1 1 2 1 1 1 1
Unit V	Relational Database Design	5
	1. Functional dependencies i. Inference Rules ii. Closure of set of functional dependencies iii. Closure of an Attribute set 2. Concept of Normalization i. Definition ii. 1NF iii. 2NF iv. 3NF 3. Examples on Normalization	2 2 1

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

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

Sr.No.	Course Objectives
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

Sr.No.	Course Outcome
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

Assignment No	Assignment Name	No. Of Sessions
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
Total Number of Sessions		14

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

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

Sr. No.	Course Objectives
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

Sr. No.	Course Outcome
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

Unit No	Title with Contents	No. of Lectures
Unit I	Introduction to Computer System	10
	1. Introduction i. The basic parts of a computer 2. History of Computers 3. Types of Computer i. Analog ii. Digital iii. Hybrid 4. Types of CPU i. Single Core ii. Dual Core iii. Quad Core 5. Types of Programming Languages i. Machine Languages ii. Assembly Languages iii. High Level Languages 6. Translators i. Assembler ii. Compiler iii. Interpreter 7. Introduction Number Systems i. Binary ii. Octal iii. Hexadecimal system iv. Conversion v. Addition vi. Subtraction vii. Multiplication viii. Division	2 2 2 4
Unit II	Computer Peripherals	06
	1. Hardware and Motherboard i. Introduction ii. Hardware upgrade	1

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

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

	<p style="text-align: center;">iii. Google Forms iv. Applications</p>	
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Suggested Reading	
1.	P.K. Sinha and Priti Sinha, "Computer Fundamentals", 3rd Edition, BPB Pub
2.	John Walkenbach, Michael Alexander and Richard Kusleika, "Excel 2019 Bible", Wiley Publication.
3.	Steven Roman, "Writing Excel Macros with VBA", O'reilly Publication
4.	Sumitabha Das, "Unix Concepts and Applications", Tata McGraw Hill Education
5.	Join Josh, "PC/HARDWARE", O'Reilly Publication

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



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

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

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

Sr.No.	Course Outcome
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

Assignment No	Assignment Name	No. of Sessions
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
		14

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)

Course Title	ADVANCED C PROGRAMMING	
Course Code: 23SBCA21MM		No. of Credits: 02
Course Type: MM (Major Mandatory)		Total Teaching Hours: 30

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

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

Unit No	Title with Contents	No. of Lectures
Unit I	Array and String	08
	1. Introduction <ul style="list-style-type: none"> i. Array Declarations ii. Bounds Checking 2. Types of Array <ul style="list-style-type: none"> i. Single dimension Arrays ii. Two dimension arrays 3. Arrays and Function 4. String Concept <ul style="list-style-type: none"> i. Declaration ii. Definition iii. initialization 5. Format specifiers String literals/constants and variables 6. Array of strings	1 1 2 2 1 1
Unit II	Pointers	10
	1. Concept <ul style="list-style-type: none"> i. Reference ii. Dereference 2. Declaration,definition,initialization,Pointer Arithmetic,Multiple indirection 3. Parameter passing <ul style="list-style-type: none"> i.call by value ii.call by reference 4. Arrays and Pointers <ul style="list-style-type: none"> i.Pointer to array ii.Array of pointers 5. Functions and pointers <ul style="list-style-type: none"> i.Passing pointer to function ii.Returning pointer from function iii.function pointer 6. Dynamic memory management, Allocation, Resizing, Releasing, Memory leak / dangling pointers	1 1 2 2 2 2
Unit III	Structure and Union	06
	1. Introduction to Structure <ul style="list-style-type: none"> i.Defining Structure ii.Declaring and Initializing Structure Variable 	1

	iii. Accessing Structure members iv. Copying and Comparing Structure Variable 2. Array of Structure 3. Nesting of Structure 4. Pointers and Structure 5. Passing Structure to function 6. Union and Difference between Structure and Union 7. Program	1 1 1 1 1 1
Unit IV	Command Line Argument and File Handling	06
	1. Introduction to Command Line Argument 2. Introduction to File Handling 3. Types of files 4. Operations on text and binary files 5. Random access file 6. Library functions for file handling <ul style="list-style-type: none"> i. fopen ii. fclose iii. fgetc, iv. fseek v. fgets vi. fputc etc. 	1 1 1 1 1 1

Suggested Readings

1. B. W. Kernighan and D. M. Ritchie, “The C Programming Language” (Second Edition), BPB Publication.
2. By Ajay Mittal, “Programming in C – A Practical Approach”, Pearson Publications.
3. Y S Kanetkar, “Let Us C”, O’Reilly Publication.
4. Cormen, Leiserson, Rivest, Stein, “Introduction to algorithms”, O’Reilly Publication
5. Herbert Schildt, “C Complete Reference”, McGraw Hill Education , 4th Edition
6. Behrouz Forouzan and Richard Gilberg, “A structured Programming Approach using C” O’Reilly Publication

Website Reference Link

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

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



**M.C.E. Society's
Abeda Inamdar Senior College**

Of Arts, Science and Commerce, Camp, Pune- 1 (Autonomous)
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F.Y.B.C.A. (Science) SEM-II (CBCS – Autonomy 2023 Pattern)

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

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 |

Unit No	Title with Contents	No. of Lectures
Unit I	Relational Database Design	12
	1. PL/Postgre SQL: Language structure 2. Controlling the program flow i. conditional statements ii. loops 3. Views 4. Functions 5. Handling errors and exceptions 6. Cursors 7. Triggers	1 2 2 2 1 2 2
Unit II	Transaction and Concurrency Control	12
	1. Transaction i. Properties of transaction ii. States of transactions iii. Concurrent execution of transactions iv. conflicting operations 2. Schedules i. Types of schedules, 3. Concept of Serializability ii. Precedence graph for Serializability 1. Ensuring Serializability by locks i. Different lock modes 4. Basic timestamp method for concurrency 5. Deadlock handling methods – i. Detection and Recovery a. Wait for graph ii. Prevention algorithms a. Wound-wait b. Wait-die iii. Deadlock recovery techniques a. Selection of Victim, b. Starvation, c. Rollback	2 1 1 1 2 4
Unit III	Crash Recovery	06
	1. Recovery concepts 2. Checkpoints 3. Recovery with concurrent transactions i. Rollback ii. Checkpoints iii. Commit 4. Log base recovery techniques	1 1 1 1 1 1

	<p>i. Deferred and Immediate update</p> <p>5. Access Control Method</p> <ul style="list-style-type: none"> i. Discretionary access control method ii. Mandatory access control iii. Role based access control for multilevel security 	
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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: https://www.tutorialspoint.com/cprogramming/	
2.	Learn C Programming : https://www.programiz.com/c-programming	
3.	CTutorial-LearnC: https://www.cprogramming.com/tutorial/c-tutorial.html	
4.	Head First C: https://www.pdfdrive.com/head-first-c-e19540108.html	
Best IDE Tools:		
Sr. No	Name of IDE or Tools	Operating System
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F.Y.B.C.A. (Science) SEM-II (CBCS – Autonomy 2023 Pattern)

Course Title	LAB I :ADVANCED C PROGRAMMING	
Course Code: 23SBCA23MM		No. of Credits: 02
Course Type: MM (Major Mandatory)		Total Teaching Hours: 60

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

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

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

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

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

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

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

Suggested Readings	
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. Busby, 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)
Website Reference Link	
1.	https://onlinecourses.nptel.ac.in/noc20_cs82/preview.



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

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

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

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

Assignment No	Assignment Name	No. of Sessions
1.	To create a view for composite or complex queries.	2
2.	To insert, update and delete records by using functions, cursors and triggers.	2
3.	Use the exception handling mechanism for the queries.	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
TOTAL		14

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



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

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

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

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

Unit No	Title with Content	No. of Lectures
Unit I	Introduction to Digital Marketing	04
	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
Unit II	Search Engine Optimization (SEO)	05
	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
Unit III	Pay-Per-Click (PPC) Advertising	05
	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
Unit IV	Social Media Marketing	04
	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
Unit V	Email Marketing	04
	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
Unit VI	Email Marketing	04
	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
Unit VII	Web Analytics	04
	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

Suggested Readings	
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)

Website Reference Link:	
1	Google Analytics Academy: https://analytics.google.com/analytics/academy
2	Hubspot Academy: https://academy.hubspot.com/courses
3	Hootsuite Academy: https://education.hootsuite.com/courses