Savitribai Phule Pune University, Pune

B.C.A. (Under Science Faculty)

(To be implemented from Academic year 2016-17)

1. Name of Program: Bachelor of Computer Applications (B.C.A.)

2. Introduction:

The B.C.A. program is a combination of computer and applied subjects from science stream. The computer related courses are being used to introduce techniques of programming, databases, web designing, system analysis, design tools and different computing environments. The applied courses including mathematics and electronics shall provide theoretical foundation for students of Computer Science.

3. Objectives:

- Produce knowledgeable and skilled human resources which is employable in IT and ITES.
- Impart knowledge required for planning, designing and building Complex Application Software Systems as well as provide support to automated systems or application.
- Produce entrepreneurs who can develop customized solutions for small and medium Enterprises.

4. Program Structure:

- The Program is of a Three Year (Six semesters) Full Time Degree Program.
- The program shall be based on credit system comprising 150 credit points.
- Each of the first three semesters shall have Six Courses and 24 credits and the remaining three shall have Seven Courses and 26 credits each.
- Theory Courses offered shall be of 2 to 4 credits and practical courses of 4 credits each.
- For Theory Course, one credit is equivalent to one clock hour direct teaching in a week and for Practical Course, one credit is equivalent to one and half hours of laboratory work in a week.

5. Eligibility for Admission:

Any candidate who has passed the XII standard Examination in Science stream from, Maharashtra State Board of Secondary and Higher Secondary Education or equivalent Board of Examination, is eligible for admission to the First Year of this program.

OR

Passed Three Year Diploma Course approved by the DTE, Maharashtra State or Equivalent authority.

6. Medium of Instruction: English

7. Award of Credits:

- Each course having 4 credits shall be evaluated out of 100 marks and student should secure at least 40 marks to earn full credits of that course.
- Each course having 2 credits shall be evaluated out of 50 marks and student should secure at least 20 marks to earn full credits of that course.
- GPA shall be calculated based on the marks obtained in the respective subject provided that student should have obtained credits for that course.

8. Evaluation Pattern:

- Each course carrying 100 marks shall be evaluated with Continuous Assessment (CA) and University Evaluation (UE) mechanism. Continuous assessment shall be of 30 marks while University Evaluation shall be of 70 marks. To pass in a course, a student has to secure minimum 40 marks provided that he should secure minimum 28 marks in University Evaluation (UE).
- Each course carrying 50 marks shall be evaluated with University Evaluation (UE) mechanism. To pass in a course student has to secure minimum 20 marks.
- CA shall be based on internal tests (minimum 2 for 20 marks). In addition, for remaining 10 marks a teacher may assign various activities such as home assignments, tutorials, seminars, presentations, group discussion etc, to the students and evaluate accordingly.

9. ATKT Rules:

- Minimum number of credits required to take admission to Second Year of B.C.A.: 32
- Minimum number of credits required to take admission to Third Year of B.C.A.: 80

10. Completion of Degree Program:

A student who earns 150 credits, shall be considered to have completed the requirements of the B.C.A. degree program and CGPA will be calculated for such student.

Titles of Papers and Scheme of Study and Evaluation for B.C.A. Program

SEM- I

Course Code	Title of Course	Credits		Lectures/Week			Evaluation		
		Th	Pr.	Th	Tu	Pr.	CA	UE	Total
BCA101	Fundamentals of Computer	4		5	-	-	30	70	100
BCA102	Basic Programming in C	4		5	-	-	30	70	100
BCA103	Applied Mathematics- I	4		5	-	-	30	70	100
BCA104	Communication Skills	3	1	4	-	2	30	70	100
BCA105	Lab I		4	-	-	8	30	70	100
BCA106	Lab II		4	-	-	8	30	70	100
	Total	15	9	19	-	18	180	420	600

SEM-II

Course Code	Title of Course	Credits		Lectures/Week			Evaluation		
		Th	Pr.	Th	Tu	Pr.	CA	UE	Total
BCA201	Computer Organization	4		5	-	-	30	70	100
BCA202	Advanced Programming in C	4		5	-	-	30	70	100
BCA203	Applied Mathematics- II	4		5	-	-	30	70	100
BCA204	RDBMS	4		5	-	-	30	70	100
BCA205	Lab -I		4	-	-	8	30	70	100
BCA206	Lab -II		4	-	-	8	30	70	100
	Total	16	8	20	-	16	180	420	600

SEM-III

Course Code	Title of Course	Credits		Lectures/Week			Evaluation		
		Th	Pr.	Th	Tu	Pr.	CA	UE	Total
BCA301	Data Structure	4		5	-	-	30	70	100
BCA302	Advanced RDBMS	4		5	-	-	30	70	100
BCA303	Software Engineering	4		5	-	-	30	70	100
BCA304	Introduction to Computer Network	4		5	-	-	30	70	100
BCA305	Lab -I		4	-	-	8	30	70	100
BCA306	Lab -II		4	-	-	8	30	70	100
	Total	16	8	20	-	16	180	420	600

SEM-IV

Course Code	Title of Course	Credits		Lectures/Week			Evaluation		
		Th	Pr.	Th	Tu	Pr.	CA	UE	Total
BCA401	C++	4		5	-	-	30	70	100
BCA402	Introduction Web Technology	4		5	-	-	30	70	100
BCA403	Advanced Networking and Network Security	4		5	-	-	30	70	100
BCA404	OOSE	4		5	-	-	30	70	100
BCA405	Lab -I		4	-	-	8	30	70	100
BCA406	Lab -II		4	-	-	8	30	70	100
BCA407	Grid and Cloud Computing	2	-	3	-	-	--	50	50
	Total	18	8	23	-	16	180	470	650

SEM-V

Course Code	Title of Course	Credits		Lectures/Week			Evaluation		
		Th	Pr.	Th	Tu	Pr.	CA	UE	Total
BCA501	Core Java	4		5	-	-	30	70	100
BCA502	Advanced Web Technology	4		5	-	-	30	70	100
BCA503	Software Testing	4		5	-	-	30	70	100
BCA504	Operating System	4		5	-	-	30	70	100
BCA505	Lab I		4	-	-	8	30	70	100
BCA506	Lab II		4	-	-	8	30	70	100
BCA507	Grid Computing	2	-	3	-	-	--	50	50
	Total	18	8	23	-	16	180	470	650

SEM-VI

Course Code	Title of Course	Credits		Lectures/Week			Evaluation		
		Th	Pr.	Th	Tu	Pr.	CA	UE	Total
BCA601	Advance Java	4		5	-	-	30	70	100
BCA602	Dot Net Technology	4		5	-	-	30	70	100
BCA603	Recent Trends in -IT	4		5	-	-	30	70	100
BCA604	Software Project Management	4		5	-	-	30	70	100
BCA605	Lab I		4	-	-	8	30	70	100
BCA606	Lab II		4	-	-	8	30	70	100
BCA607	Green Computing	2	-	3	-	-	--	50	50
	Total	18	8	23	-	16	180	470	650

First Year B.C.A. (Under Science) Semester I

Course Code: BCA 101 **Course Title:Fundamentals of Computer**

Total Contact Hours: 48 hrs. (60 Lectures) **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory- 05 Lect./ Week

Course Objectives: The objective of this course is to study the basics of Computer System and to learn how to configure computer devices

UNIT NO.	DESCRIPTION	No. of LECTURES
UNIT 1	1. **Introduction to Computer System** 1.1. Introduction, Characteristics of Computers, Block diagram of computer 1.2. Types of computers and features- Mini Computers, Micro Computers, Mainframe Computers, Super Computers, Laptops and Tablets 1.3. Types of Programming Languages- Machine Languages, Assembly Languages, High Level Languages 1.4. Translators- Assembler, Compiler, Interpreter 1.5. Data Organization- Drives, Files, Directories	**10**
UNIT 2	**2. Introduction to Computer Peripherals** 2.1. Primary And Secondary storage devices 2.2. Primary storage devices – RAM, ROM, PROM, EPROM 2.3. Secondary Storage Devices - CD, HD, Pen drive 2.4. I/O Devices- Scanners, Digitizers, Plotters, LCD, Plasma Display, 2.5. Pointing Devices –Mouse,Joystick,Touch Screen 2.6. Number Systems 2.7. Introduction to Binary, Octal, Hexadecimal system Conversion, Simple Addition, Subtraction, Multiplication, Division	**08**
UNIT 3	**3. Concepts of Software** 3.1. Difference between imperative knowledge and definitional knowledge. Difference between fixed program and stored program computers. Definitions of syntax, static semantics, and semantics. Explain straight line, branching, and looping programs. 3.2. Definition: software, Types of software: System Software, Application Software. System Software: Operating System. Types of O.S. 3.3. Internal and External Commands, Batch Files. 3.4. Introduction to DOS and its limitations. 3.5. MS Windows: Desktop, Icons, File and Directory, Structure, Menu Items, Control Panel, File and Directory Search, Notepad, Paintbrush, Utility programs: Anti-virus, DiskCleaning, Defragmentation,	**12**

	Compression/Decompression of files. 3.6. Application software: Examples of commercial software with brief introduction.	
UNIT 4	**4. Editors and Word Processors** 4.1. Basic Concepts, Examples: MS-Word, gedit, vi. 4.2. Introduction to desktop publishing	**07**
UNIT 5	5. **Spreadsheets** 5.1. Purpose, usage 5.2. Creation of files in Spreadsheet	**08**
UNIT 6	**6. Presentation Tool** 6.1. Design Slides (using Text, images, charts, clipart) 6.2. Slide Animation 6.3. Template and theme creation	**05**
UNIT 7	**7. PC Hardware** 7.1. Introduction of Hardware. 7.2. Type and Working of Hardware parts – Ports, Motherboard, CPU. 7.3. Basic Input and Output Setting(BIOS), Network Interface Card(NIC), 7.4. Graphics card.	**05**
UNIT 8	**8. Troubleshooting and Preventing Problems** 8.1. Logical Fault Isolation – ADJUST method, Common Networking Problems, Tools for gathering information, Troubleshooting PC hardware	**05**

Reference Books:

1. Computer Fundamentals by P.K. Sinha &Priti Sinha, 3rd edition, BPB pub.
2. Computers Today by S. BasandraGalgotia Pub.
3. Microsoft Office 2000 by Vipra Computers, Vipra Printers Pvt. Ltd.
4. Advanced Microsoft Office 2000 by Meredith Flynin, Nita Rutkosky, BPB Pub using Microsoft office 2007 by Ed Bott ,Woody Leonhard , Pearson publication\
5. PC/HARDWARE BY-Join Josh O`Reilly Publication

First Year B.C.A. (Under Science) Semester I

Course Code: BCA 102 **Course Title: Introduction to Programming & Programming in C**

Total Contact Hours: 48 hrs. (60 Lectures) **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory- 05 Lect./ Week

Course Objectives: The objective of this course is to provide a broad overview of problem solving techniques and use of c language programming to solve these problems.

UNIT NO.	DESCRIPTION	No. of LECTURES
UNIT 1	**1. Problem Solving Concept:** 1.1. Requirement of solving problems by computer , 1.2. Problem solving aspects.	**02**
UNIT 2	**2. Algorithms and Flowcharts:** 2.1. Definition & Characteristics of algorithm 2.2. Simple examples on algorithms 2.3. Flow charts 2.4. Simple examples on charts	**06**
UNIT 3	**3. Arithmetic problem solving using algorithm and flow charts:** 3.1. Examples on Simple Arithmetic Statements, Conditional Statement&IterativeStatements(such as Addition/Multiplication, check number is positive/negative, Maximum of 2 numbers & 3 numbers,sum of first n numbers, sum of given n numbers, reverse digits of number check number is palindrome, check number is prime,factorial of number, factors of number, GCD, LCM of numbers etc.)	**09**
UNIT 4	**4. Introduction to C Language** 4.1. Introduction to C 4.2. Features of C 4.3. Structure of C Program	**03**
UNIT 5	**5. C Fundamentals** 5.1. C Character Set, Identifiers and Keywords 5.2. Variables and constants 5.3. Data types- Basic data types, Enumerated types, 5.4. Type casting 5.5. Declarations, Expressions	**05**
UNIT 6	**6. Operators and Expressions** 6.1. Unary plus and minus operators 6.2. Binary arithmetic operators 6.3. Increment Decrement operators 6.4. Relational and logical operators 6.5. Bit wise operators 6.5.1. Assignment operators	**05**

	6.5.2. Comma operator, size of operator 6.5.3. Ternary conditional operator 6.5.4. Precedence and associativity	
UNIT 7	**7. Data Input Output Statements** 7.1. printf, scanf functions 7.2. getchar, putchar, getch functions 7.3. gets, puts functions 7.4. Escape sequence characters 7.5. Format specifiers	**06**
UNIT 8	**8. Control Statements** 8.1. If, If- Else Statements 8.2. Nested If Statements 8.3. Conditional Branching – switch statement 8.4. Loop (while, do…while, for) 8.5. break, continue, gotostatements.	**08**
UNIT 9	**9. Functions** 9.1. Introduction to Functions 9.2. Function Arguments 9.3. Library & User defined functions 9.4. Methods of Calling Function 9.5. Recursion 9.6. Storage Classes	**08**
UNIT 10	**10. Arrays** 10.1. Introduction 10.2. Array Declarations 10.3. Bounds Checking 10.4. Single dimension Arrays 10.5. Two dimension Arrays 10.6. Arrays & Function	**08**

Reference Books:

1. Introduction to algorithms – Cormen, Leiserson, Rivest, Stein
2. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie,ISBN:9788120305960, PHI Learning
3. How to Solve it by Computer, R.G. Dromey, ISBN: 9788131705629, PearsonEducation
4. A Structured Programming Approach Using C, Behrouz A. Forouzan, RichardF. Gilberg ISBN:9788131500941, Cengage Learning India
5. Programming in ANSI C, E. Balaguruswamy, ISBN: 9781259004612, Tata Mc-Graw Hill Publishing Co Ltd.-New Delhi

First Year B.C.A. (Under Science) Semester I

Course Code: BCA 103 **Course Title:Applied Mathematics -I**

Total Contact Hours: 48 hrs. (60 Lectures) **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory- 05 Lect./ Week

Course Objectives: The objective of this course is to study the applied Mathematics.

UNIT NO.	DESCRIPTION	No. of LECTURES
UNIT 1	**1. Numbers, Sets, and Functions** 1.1. The Quadratic Formula 1.2. Elementary Inequalities 1.3. Sets 1.4. Functions 1.5. How to Approach Problems	**08**
UNIT 2	**2. Language and Proofs** 2.1. Two Theorems about Equations 2.2. Quantifiers and Logical Statements 2.3. Compound Statements 2.4. Elementary Proof Techniques, 2.5. How to Approach Problems	**12**
UNIT 3	**3. Induction** 3.1. The Principal of Induction 3.2. Applications 3.3. Strong Induction 3.4. How to Approach Problems	**08**
UNIT 4	**4. Bijection and Cardinality** 4.1. Representation of Natural Numbers 4.2. Bijections 4.3. Injection and surjections 4.4. Composition of Functions 4.5. Cardinality 4.6. How to Approach Problems	**12**
UNIT 5	**5. Combinatorial Reasoning** 5.1. Arrangements and Selections 5.2. Binomial Coefficients 5.3. Permutations 5.4. Functional Digraphs 5.5. How to Approach Problems	**10**
UNIT 6	**6. Divisibility** 6.1. Factors and Factorization 6.2. The Euclidean Algorithm 6.3. The Dart Board Problem 6.4. Polynomials	**10**

Reference Books:

1. *Mathematical Thinking–Problem Solving and Proofs.* (Second Edition)by John P. D'Angelo& Douglas B. West. Prentice Hall.
2. *Applied Discrete Structure for Computer Science* by Alan Doerr&KnennethLevasseur.

First Year B.C.A. (Under Science) Semester I

Course Code: BCA 104 **Course Title:Communication Skills**

Total Contact Hours: 48 hrs. (60 Lectures) **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory- 05 Lect./ Week

UNIT NO.	DESCRIPTION	No. of LECTURES
UNIT 1	**1. Introduction to Communication** 1.1. Introduction 1.2. Meaning 1.3. Definition 1.4. Process, importance. 1.5. Principles of effective communication 1.6. Scope of Business communication - Internal & External 1.7. Barriers to Communication, Overcoming the barriers	**09**
UNIT 2	2. **Listening Skills** 2.1. Types of Listening (theory /definition) 2.2. Tips for Effective Listening 2.3. Academic Listening- (lecturing) 2.4. Listening to Talks and Presentations 2.5. Listening to Announcements- (railway/ bus stations/ airport / stadium announcement etc.) 2.6. Listening to Radio and Television	**08**
UNIT 3	**3. Telephone Skills** 3.1. Basics of Telephone communication 3.2. How to handle calls- telephone manners 3.3. Leaving a message 3.4. Making requests 3.5. Greeting and Leave Taking over phone(etiquette) 3.6. Asking for and giving information 3.7. Giving Instructions 3.8. Listening for Tone/Mood and Attitude at the other end Handling the situations especially trouble shooting, Tele-conference handling, Handling Tele interviews for Call Centre's	**08**
UNIT 4	4. **Writing Skills** 4.1. Standard Business letter 4.2. Report writing 4.3. Email drafting and Etiquettes 4.4. Preparing agenda and writing minutes of meetings 4.5. Making notes on Business conversations 4.6. Effective use of SMS and Case writing and Documentation	**12**
UNIT 5	**5. Career Skills** 5.1. Applying for job 5.2. Cover letters 5.3. Resume and Effective Profiling	**08**

	5.4. Interviews 5.5. Group discussions	
UNIT 6	**6. Soft Skills** 6.1. Empathy(Understanding of someone else'spoint of view) 6.2. Intrapersonal skills 6.3. Interpersonal skills 6.4. Problem solving 6.5. Reflective thinking, Critical thinking 6.6. Negotiation skills	**15**

Reference Books:

1. Business Communication, Asha Kaul, PHI
2. Business Communication, M. Balasubramanyam
3. Business correspondence and report writing, Sharma, K. Mohan, TataMc-Graw Hill

First Year B.C.A. (Under Science) Semester I

Course Code: BCA 105 **Course Title: Lab – I**

Objectives:

i. Design and implement 'C' programs for simple problems

ii. Understand appropriate use of data types and array structures

iii. Understand use of appropriate control structures

Sr. No.	Assignment	No. of Slots
1.	Assignment on use of data types, simple operators (expressions)	02
2.	Assignment on decision making statements (if and if-else, nested structures)	02
3.	Assignment on decision making statements (switch case)	01
4.	Assignment on use of while loops	02
5.	Assignment on use of for loops	02
6.	Assignment on nested loops	01
7.	Assignment on exit, goto, continue, break	02
8.	Assignment on menu driven programs.	02
9.	Assignment on writing C programs in modular way (use of user defined functions)	02
10.	Assignment on call by value	01
11.	Assignment on call by reference	01
12.	Assignment on recursive functions	02
13.	Assignment on use of arrays (1-D array) and functions	02
14.	Assignment on use of multidimensional array (2-D arrays) and functions	02
15.	Assignment on Standard Library Function	02
	Total slots Required	**26**

First Year B.C.A. (Under Science) Semester I

Course Code: BCA 106 **Course Title: Lab – II**

Sr. No.	Assignment	No. of Sessions
1.	Operating System Installation (Demo)	04
2.	Spreadsheet	04
3.	Presentation Tool	04
4.	Shell Command	05
5.	HTML	09
	Total slots Required	**26**

First Year B.C.A. (Under Science) Semester II

Course Code: BCA 201 **Course Title: Computer Organization**

Total Contact Hours: 48 hrs. (60 Lectures) **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory- 05 Lect./ Week

Course Objectives: The objective of this course is to provide a broad overview of architecture and functioning of computer systems and to learn the basic concepts behind the architecture and organization of computers.

UNIT NO.	DESCRIPTION	No. of LECTURES
UNIT 1	**1. Data representation and Computers Arithmetic:** 1.1. Decimal, Binary, Octal, Hexadecimal Number system and their inter-conversion, BCD code, Gray code, Excess-3 code, ASCII , EBCDIC, Unicode, Concept of parity code. Signed and Unsigned numbers, 1's and 2's complement of binary numbers, Binary arithmetic (Addition, subtraction and subtraction using1's complement and 2's complement).	06
UNIT 2	**2. Logic Gates :** 2.1. Introduction to digital signal, positive and negative logic concept, Logic gates – statement, symbol, expression and truth table of basic and derived logic gates (AND,OR,NOT,XOR,XNOR,NOR,NAND), Boolean algebra and identities, De-Morgan's theorem and Inter conversion of logic gates.	09
UNIT 3	**3. Combinational Circuits:** 3.1. Half adder, Full adder, Half subtractor, Parallel adder, Nibble adder, Multiplexer (up to 4 to 1 MUX), and De multiplexer (up to 1to 4 DEMUX), Encoder(Decimal to BCD encoder and 3 bit priority encoder), Decoder(3 to 8 line decoder using gates only)	07
UNIT 4	**4. Sequential circuits:** 4.1. Concept of sequential circuits; Latch, Flip-flops RS, clocked RS, JK, T, D, Counter –(types: synchronous, asynchronous), upto 3 bit up, down and up-down Counter (asynchronous only), modulo –N counter, shift register (IC 7495), Ring counter, Johnson counter.	08
UNIT 5	**5. CPU Organization:** 5.1. Block diagram of CPU, functions of CPU, general register organization, stack organization (operation of stack, types of stack, register stack and memory stack), block diagram of ALU.	07
UNIT 6	**6. Memory Organization:** 6.1. Memory System Overview, Memory Design, Cache Memory, Internal Memory, External Memory, Virtual Memory.	08

UNIT 7	**7. I/O Organization:** 7.1. Introduction, peripheral devices, I/O interface, serial communication (asynchronous and synchronous data transfer). Concept of interrupts, IVT and size of IVT, types of I/O transfer (CPU initiated, interrupt initiated and DMA), DMA controller.	**08**
UNIT 8	**8. Architecture of Microprocessor 8086 and parallel Processing:** 8.1. Block diagram of 8086, 8086 registers, Numerical co-processor concept and block diagram and functional diagram of numerical co-processor. Concept of parallelism, parallel computer structures, concept of pipeline, instruction pipeline, Arithmetic pipeline. Concept of RISC and CISC.	**07**

Reference Books:

1. Modern Digital Electronics: R.P. Jain.
2. Digital Fundamentals: Flod and Jain, Pearson Publication.
3. Digital Design: Morris Mano, Prentice-Hall.
4. Computer System Architecture: Morris Mano, Prentice-Hall.
5. Computer Organization and architecture (6^{th} Edition): William Stalling, Prentice-Hall.
6. Microprocessor and Interfacing Programming and Hardware: Douglas Hall, Tata McGraw Hill
7. Computer Architecture and Organization by John P Hayes, Tata McGraw Hill.
8. Pipelined and Parallel Computer Architecture by Sajjan G Shiva, Prentice Hall. 1996, First Edition

First Year B.C.A. (Under Science) Semester II

Course Code: BCA 202 **Course Title: Advanced Programming in C**

Total Contact Hours: 48 hrs. (60 Lectures) **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory- 05 Lect./ Week

Course Objectives: The objective of this course is to study theAdvanced Programming in C.

UNIT NO.	DESCRIPTION	No. of LECTURES
UNIT 1	1. **Preprocessor** 1.1. Concept 1.2. Format of preprocessor directives 1.3. File inclusion directives (#include) 1.4. Macro substitution directives (#define), nested macros, parameterized macros 1.5. Macros versus functions 1.6. #error / #pragma directives 1.7. Conditional compilation (#if/#ifdef/#else/#elif/#endif) 1.8. Predefined macros (_DATE_ / _TIME_ /_FILE_ /_LINE_ / _STDC_) 1.9. Preprocessor operators 1.9.1. Macro continuation (\) 1.9.2. stringize (#) 1.9.3. token pasting (##) 1.9.4. defined()	**06**
UNIT 2	2. **Pointers** 2.1. Concept – reference & dereference (Data model – Value model v/s Reference model) 2.2. Declaration, definition, initialization & use 2.3. Types of pointers 2.4. Pointer Arithmetic 2.5. Relationship between Arrays & Pointers 2.5.1. Pointer to array 2.5.2. Array of pointers 2.6. Multiple indirection (introduction of double pointer) 2.7. Functions & pointers 2.7.1. Passing pointer to function 2.7.2. Returning pointer from function 2.7.3. Function pointer 2.8. Pointers &const 2.9. Dynamic memory management 2.9.1. Allocation 2.9.2. Resizing 2.9.3. Releasing 2.9.4. Memory leak / dangling pointers	**12**

UNIT 3	3. **Strings** 3.1. Concept 3.2. Declaration, definition, initialization, format specifiers 3.3. String literals/ constants & variables – reading & writing from & to console 3.4. Importance of terminating NULL character 3.5. Strings & pointers 3.6. Array of strings & array of character pointers 3.7. User defined functions for predefined functions in string.h 3.7.1. strlen / strcpy / strcat / strcmp / strcmpi / strrev / strlwr / strupr / strset / strchr / strrchr / strstr / strncpy / strncat / strncmp / strncmpi / strnset / strtok 3.8. Command line arguments	**12**
UNIT 4	4. **Structures** 4.1. Concept 4.2. Declaration, definition, initialization, accessing structure members (. operator) 4.3. Array of structures 4.4. Pointers to structures 4.4.1. Declaring pointer to structure 4.4.2. Accessing structure members via pointer to structure (→ operator) 4.5. Structures & functions 4.5.1. Passing each member of structure as a separate argument 4.5.2. Passing structure by value / address 4.6. Nested structures 4.7. typedef& structures 4.8. typedef versus #define 4.9. Bit fields 4.9.1. Concept, need, use	**14**
UNIT 5	5. **Unions** 5.1. Concept 5.2. Declaration, definition, accessing union members 5.3. Difference between Structures & unions	**06**
UNIT 6	**6. File Handling** 6.1. Concept of streams, filesneed 6.2. Types of files 6.3. Operations on text & binary files 6.4. Random access to files	**10**

Reference Books:

1. The C Program*m*ing Language (Second Edition) – By B. W. Kerninghan& D. M. Ritchie
2. Programming in C – A Practical Approach – By Ajay Mittal (Pearson Publications)
3. Programming with C – By Byron S Gottfried (Schaum's Outlines)
4. A structural Programming Approach using C – By BehrouzForouzan& Richard Gilberg

First Year B.C.A. (Under Science) Semester II

Course Code: BCA 203 **Course Title: Applied Mathematics -II**

Total Contact Hours: 48 hrs. (60 Lectures) **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory- 05 Lect./ Week

Course Objectives: The objective of this course is to study the applied Mathematics.

UNIT NO.	DESCRIPTION	No. of LECTURES
UNIT 1	**1. Modular Arithmetic** 1.1. Relations 1.2. Congruences 1.3. Applications 1.4. Fermat's Little Theorem 1.5. Congruence and Groups	**15**
UNIT 2	**2. Two Principles of Counting** 2.1. The Pigeonhole Principle 2.2. The Inclusion-Exclusion Principle	**06**
UNIT 3	**3. Graph Theory** 3.1. The Königsberg Bridge Problem 3.2. Isomorphism of Graphs 3.3. Connection and Trees 3.4. Bipartite graphs 3.5. Coloring Problems 3.6. Planar Graphs	**25**
UNIT 4	**4. Recurrence Relations** 4.1. General Properties 4.2. First-Order Recurrences 4.3. Second-Order Recurrences 4.4. General Linear Recurrences 4.5. Other Classical Recurrences 4.6. Generating Functions	**14**

Reference Books:

1. *Mathematical Thinking–Problem Solving and Proofs.* (Second Edition) by John P. D'Angelo& Douglas B. West. Prentice Hall.
2. *Applied Discrete Structure for Computer Science* by Alan Doerr&KnennethLevasseur.

First Year B.C.A.(Under Science) Semester II

Course Code: BCA 204 **Course Title: Relational Database Management System**

Total Contact Hours: 48 hrs. (60 Lectures) **Total Credits: 04** **Total Marks: 100**

Teaching Scheme: Theory- 05 Lect./ Week

Course Objectives: The objective of this course is to study the basics DBMS and to learn SQL.

UNIT NO.	DESCRIPTION	No. of LECTURES
UNIT 1	**1. File Organization** 1.1. Introduction 1.2. Physical / logical files 1.3. Record organization (fixed, variable length) 1.4. Types of file organization(heap, sorted, indexed,hashed)	**04**
UNIT 2	**2. Introduction of DBMS** 2.1. Overview 2.2. File system Vs. DBMS, 2.3. Describing & storing data (Data models - relational, hierarchical, network) 2.4. Levels of abstraction 2.5. Data independence 2.6. Structure of DBMS 2.7. Users of DBMS 2.8. Advantages of DBMS	**06**
UNIT 3	**3. Conceptual Design (E-R model)** 3.1. Overview of DB design 3.2. ER data model (entities, attributes, entity sets, relations, relationship sets) 3.3. Additional constraints (key constraints, participation constraints, weak entities, aggregation / generalization) 3.4. Case studies	**10**
UNIT 4	**4. Structure of Relational Databases** 4.1. Concepts of a table, a row, a relation, a tuple and a key in a relational database 4.2. Conversion of ER to Relational model 4.3. Integrity constraints (primary key, referential integrity, Null constraint, unique constraint, check constraint)	**05**
UNIT 5	**5. SQL** 5.1. Introduction 5.2. DDL commands (create, drop, alter) with examples 5.3. Basic structure SQL query 5.4. Set operations 5.5. Aggregate functions 5.6. Null values 5.7. Nested Sub-queries	**20**

	5.8. Modifications to Database (insert, delete, update) 5.9. SQL mechanisms for joining relations (inner joins, outer joins and their types) 5.10. Examples on SQL (case studies)	
UNIT 6	**6. Relational Database Design** 6.1. Pitfalls in Relational-Database Design (undesirable properties of a RDB design like repetition, inability to represent certain information) 6.2. Functional dependencies (Basic concepts, Closure of set of functional dependencies, Closure of an Attribute set) 6.3. Concept of a Super Key and a primary key (Algorithm to derive a Primary Key for a relation) 6.4. Concept of Decomposition 6.5. Desirable Properties of Decomposition (Lossless join and Dependency preservation) 6.6. Concept of Normalization 6.7. Normal forms (only definitions) 1NF, 2NF, 3NF, BCNF 6.8. Examples on Normalization	**15**

Reference Books:

1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S. Sudarshan,Tata McGraw-Hill Education
2. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill Science/Engineering/Math; 3 Edition
3. Database Systems, Shamkant B. Navathe, RamezElmasri,Pearson Higher Education

First Year B.C.A. (Under Science) Semester II

Course Code: BCA 205 **Course Title: Lab – I**

Objectives:

Sr. No.	Assignment	No. of Slots
1.	To demonstrate use of preprocessor directives	2
2.	To demonstrate use of simple pointers	2
3.	To demonstrate advanced use of pointers	3
4.	To demonstrate concept of strings, array of strings	3
5.	To demonstrate string operations using pointers	3
6.	To demonstrate command line arguments	1
7.	To demonstrate structures (using array and functions)	2
8.	To demonstrate nested structures and Unions	2
9.	To demonstrate use of bitwise operators.	2
10.	To demonstrate file handling	4
	Total slots Required	**24**

First Year B.C.A. (Under Science) Semester II

Course Code: BCA 206 **Course Title: Lab – II**

Sr. No.	Assignment	No. of Sessions
1.	Case study – ER diagram	01
2.	Case study – ER diagram (with generalization)	01
3.	Case study – ER diagram (with aggregation)	01
4.	Using PostgreSQL (demo of PostgrSQL)	01
5.	Data Definition queries (Create)	01
6.	Data Definition querie (Alter)	01
7.	Data Definition queries (Drop)	01
8.	Simple queries (Select)	03
9.	Queries with join	02
10.	Aggregate queries (Group by and Having)	03
11.	Nested Queries	03
12.	Data Manipulation queries (Insert)	02
13.	Data Manipulation queries (Delete)	02
14.	Data Manipulation queries (Update)	02
	Total slots Required	**24**