MANGALORE UNIVERSITY
Choice Based Credit System Semester Scheme with Multiple Entry and Exit Options in the UG Programmes under NEP 2020

Bachelor of Computer Applications (BCA) Degree Programme
2021-2022 Onwards
I SEMESTER BCA
BLOWN UP SYLLABUS & PRACTICAL LISTS

Course Code: CAC01	Course Title: **Fundamentals of Computers**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03

Topics	Chapter Number	Section
Unit-1 [12 Hours]		
Computer Basics: Introduction, Characteristics computers, Evolution computers, Generations of computers, Classification of computers, the computer system, Application of computers.	Book 1 Chapter 1	1.1 to 1.6
Computer Architecture: Introduction, Central processing unit- ALU, Registers, Control unit, system bus, main memory unit, cache memory	Book 1 Chapter 2	2.1, 2.2
Input devices: Introduction, Types of input devices, Keyboard, Mouse, Track ball, Joystick light pen, Touch screen and track pad. Speech recognition, digital camera, webcam, Scanners	Book 1 Chapter 4	4.1, 4,2,1, 4.2.2, 4.2.4, 4.2.5, 4.2.6 (Excluding the working of devices)
Output devices: Types of output, Classification of output devices, Printers – Dot matrix, Ink-jet, Laser, Hydra, Plotter, Monitor – CRT, LCD, Differences between LCD and CRT	Book 1 Chapter 4	4.3, 4.3.1, 4.3.2, 4.3.4, (Excluding the working of devices and Daisy wheel Printer)
Unit- 2 [10 Hours]		
Computer software: Introduction, software definition, relationship between software and hardware, software categories	Book 1 Chapter 11	11.1, 11.2, 11.3
Computer programming languages: Introduction, Developing a program, Program development cycle, Types of programming languages, generation of programming languages, Features of a good programming language.	Book 1 Chapter 10	10.1, 10.9, 10.10, 10.11
Algorithm: Steps involved in algorithm development, Algorithms for simple problems (To find largest of three numbers, factorial of a number, check for prime number, check for palindrome , Count number of odd, even and zeros in a list of integers)	Book 1 Chapter 10	10.2
Flowcharts: Definition, advantages, Symbols used in flow charts. Flowcharts for simple problems mentioned in algorithms. Psuedocode, Pseudocode Guidelines, Limitations of Pseudocode.	Book 1 Chapter 10	10.3, 10.5

Unit – 3 [10 Hours]		
Digital Computers and Digital System: Introduction to Number System, Decimal number, Binary number, Octal and Hexadecimal numbers, Number base conversion, Complements, Binary codes, Binary arithmetic, Addition, Subtraction in the 1's and 2's complements system, Subtraction in the 9's and 10's complement system.	Book 2 Chapter 1	1.2, 1.3, 1.4, 1.5
Boolean Algebra: Basic definitions, Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra, Venn diagram.	Book 2 Chapter 2	2.1, 2.2, 2.3
Unit – 4 [10 Hours]		
Digital logical gate: Boolean functions, Canonical and Standard forms, Minterms, Maxterms, other logic operations, Digital logic gates, Universal gates.	Book 2 Chapter 2 Chapter 4	2.4, 2.5, 2.6, 2.7 (Excluding 2.7.1), 4.7.1
Simplification of Boolean function: The map method, Two and three variable maps, Four-variable maps, Product of Sums simplification, Don't care conditions,	Book 2 Chapter 3	3.1, 3.2, 3.3, 3.5, 3.8

Text Book:
1. ITL Education Solution Limited, Introduction to Information Technology, Second Edition, Pearson
2. M. Morris Mano,Digital Logic and Computer design, PHI, 2015

Reference Books
1. Pradeep K. Sinha and Priti Sinha, Computer Fundamentals, Sixth Edition, BPB Publication.
2. David Riley and Kenny Hunt, Computational thinking for modern solver, Chapman & Hall/CRC.
3. J. Glenn Brook shear, Computer Science: An Overview, Twelfth Edition, Addision-Wesley
4. R.G. Dromey, How to solve it by Computer, PHI.

Course Code: CAC02	Course Title: **Programming in C**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03

Contents	Chapter
Unit – 1 [12 Hours]	
Overview of C : History of C , Importance of C Program, Basic structure of a C-program, Execution of C Program.	1
C Programming Basic Concepts: Character set, C token, Keywords and identifiers, Constants, Variables, data types, Declaration of variables, assigning values to variables, defining symbolic constants.	2
Input and output with C: Formatted I/O functions - *printf* and *scanf,* control stings and escape sequences, output specifications with *printf* functions; Unformatted I/O functions to read and display single character and a string - *getchar, putchar, gets* and *puts* functions.	4
Unit – 2 [10 Hours]	
Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associatively; Evaluation of arithmetic expressions; Type conversion.	3
Control Structures: Decision Making and Branching -Decision making with if statement, simple if statement, the if else statement, nesting of if … else statements, the else if ladder, the switch statement, the ?: operator, the go to statement. Decision making and looping - The while statement, the do statement, for statement, nested loops, exit, break, jumps in loops.	5,6
Unit – 3 [10 Hours]	
Derived data types in C: Arrays - declaration, initialization and access of one-dimensional and two-dimensional arrays. programs using one- and two-dimensional arrays, sorting and searching arrays.	7
Handling of Strings: Declaring and initializing string variables, reading strings from terminal, writing strings to screen, Arithmetic operations on characters, String handling functions - *strlen, strcmp, strcpy, strstr and strcat;* Character handling functions - *toascii, toupper, tolower, isalpha, isnumeric* etc.	8
Pointers: Understanding pointers, accessing the address of a variable, declaring and initializing pointers, accessing a variable through its pointer, pointer expression, pointer increments and scale factor, pointers and arrays, pointer and strings.	11
Unit – 4 [10 Hours]	
User-defined functions: Need for user-defined functions, Declaring, defining and calling C functions, return values and their types, Categories of functions: With/without arguments, with/without return values. Nesting of functions.	9
Recursion: Definition, example programs. **Structures and unions:** Structure definition, giving values to members, structure initialization, comparison of structure variables, arrays of structures, arrays within structures, Structure and functions, structures within structures. Unions	10

Text Book:

1. E. Balagurusamy, Programming in ANSI C, 5/6/7th Edition, Tata McGraw Hill

Reference Books:

1. Herbert Schildt, C: The Complete Reference, 4th Edition, (Osborne Complete Reference Series)
2. Brain W. Kernighan, C Programming Language, 2nd Edition, Prentice Hall Software
3. Kernighan & Ritchie: The C Programming Language, 2nd Edition, PHI
4. Kamthane, Programming with ANSI and TURBO C, Pearson Education
5. V. Rajaraman, Computer Programming in C, 2nd Edition, PHI
6. S. Byron Gottfried, Programming with C, 2nd Edition, TMH
7. Yashwant Kanitkar, Let us C, 15th Edition, BPB
8. P.B. Kottur, Computer Concepts and Programming in C, 23rd Edition, Sapna Book House

Course Code: CAC03	Course Title: **Mathematical Foundation**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03

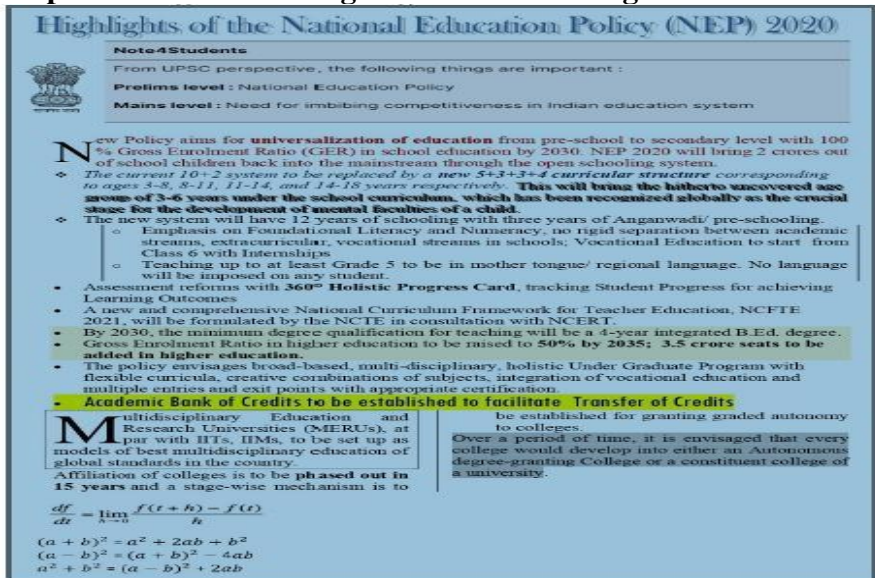| Contents	Book	Section/Subsections
Unit – 1 [12 Hours]		
Logarithms: Introduction, Laws of operations (Statements only), Illustrations 1(a), (P 193-195),2,3(i,ii,iii,v) Change of Base rule (statement only), Examples 2,3,4,5,7, 14 (P 195, 197-199, 204), 19(a) (P 206), Exercise(I) 1, 2, 3 5(a),8(a((i ,ii)) 11(a), (b), C(i), 17(a)(i, ii)	**1**	7.0 7.1 10.1 10.2
Binomial Theorem: Statement only (P 334), Example 1, 2(P 336), 5 Exercise (I)(i, ii) 2 (i) & (ii) (P 338) Positions of Terms Examples 5 (P 337), 7(a) & 7 (b) (P 339) Exercise (II)-6(i),7 (P 350)	**1**	15.0 15.1 15.2
Analytical Geometry : Introduction, Directed Line, Quadrants, Example 1 (P 555) , Coordinates of the midpoints, (statement and example) (P 556), Distance between two points (Only formula no proof), Section Formula, External Division, Coordinates of Centroid, Area of a Triangle (Only statements), Examples 2(a) & (b) (P 557), 3, 4, 7,11(P 558, 559, 562,565) Exercise I-1(i ,ii), 3,5, 9(i), 15 (a) and (b), 16(a) and (b) 21(a), 24 (i) & (ii)	**1**	15.4 15.5 15.6 15.7 15.8 15.9
Straight Line: Slope or gradient of a straight line (formula Only), Different forms of equations of straight line (Statements- I,V,VII,IX), General equation of a straight Line (Statement Only), Example 18(P 579), Condition of Parallelism and perpendicularism (P 585, Only formula), Example 29(587) Exercise 2 (a,b), 3(b) (i), (ii) and (iii) (P 592), 13 (i,ii)	**1**	15.13 15.14 15.15 15.16 15.22 15.23 15.24
Circle: The equation of a Circle (only Formula, I and II), Illustration (P 597), General Equation of the Circle(Statement only), Finding centre and radius Example (37,39) (P 601) Exercise (III): 5(i) (P 612), 6(a) Equation of tangent and normal (Statement only, P 605 and 606) Example 50	**1**	15.25 15.26
Unit – 2 [10 Hours]		
Trigonometry Quadrants, Measurement of Angles (I, III), Circular measure, Example 2, Exercise 3 (a) i and ii, 4 (P 483), Trigonometric functions (definition only) , trigonometric Ratios, relation between trigonometric functions I II & III only formulae (P 487), Signs of Trigonometric functions, T-ratios of standard angles (Only table P 503), Example 25 (P 493), Exercise(II) 12 (a),(b), 13(d, e) (P 499) Exercise(III) 1 (i) (ii) (iii), 2 (a), 4(a), (b)	1	14.1 14.2 14.3 14.4 14.5 14.6(Table only)
Calculus Limit of a function, definition (P 633), Some Important Limits(I, II III IV), Example 3, 4 (P 635) Exercise 1(a), (c) (P 645)	1	16.5 16.7 16.8
Continuity of a Function Statement only, Example 16(a) (b) (c) (d) (P 641, 642), Exercise 5, 6 (P 645)	1	
Differentiation Definition, Derivative of a power function, derivative of a constant with any function, derivative of sum of functions, derivative of product of two	1	17.1 17.3 to 17.7

function, derivative of the quotient of the two functions (Only statements), Illustration 1, 2 and 3,4 (P 652, 653), Illustrations 1, 2 (P 656, 657) Exercise (I) 1 (a) (b), 2 (a), (b) **Integration** Definition (P 724), Indefinite Integrals, Rules of Integration, Some Standard Results (Formula Only) (I II & IX) Illustration 1, 2, 3,4,5 (P 727), Exercise 1, 2(i) &(ii) (P 730) Definite Integrals (Definition P 757), Illustration 1,2,3,5 (P 758, 759), Exercise (VI) 4(i)	1	18.1 to 18.3 18.10

Unit – 3 [10 Hours]

Matrix Algebra Introduction, definition, types of matrices, Illustration, scalar multiplication of matrices, Illustrations, equality of matrices, Illustrations 1,2,3 Exercise (I) 1,2,3 matrix operations, Addition and subtraction, Example 1(P 803), Multiplication, Example 2,3,4,12,13 Exercise(II):1(i,ii,iii),2, 13 Transpose of a matrix, Example: 15, symmetric matrix, skew symmetric and orthogonal matrix (P 822,823), Exercise (III): 1(a), 2, 3 Determinants of a square matrix, determinants of order two, Example (P 824),17 , Determinant of order three, expansion of the determinants, minors of a matrix, co-factors of a matrix, Example:23, 24,25 Exercise (VI): 1,3 Adjoint of a square matrix, Rank of a matrix. Illustrations:1,2,3 Exercise (VIII):4(i, ii)	1	20.1, 20.2 20.3, 20.4 20.5, 20.6 20.8, 20.10 20.11, 20.12 20.14 20.18 20.19 20.20 20.21 20.25
echelon form of a matrix (Statement and example only) , normal form of a matrix (only statement), equivalence of matrices (only statement)	3	Page-371,373,375

Unit – 4 [10 Hours]

Inverse of a matrix (using adjoint matrices –cofactor method), Example:27 Exercise (VII): 1, 2,4	1	20.22
Characteristic equation of a matrix (statement only), Cayley Hamilton theorem (Statement only), example 9.2.3- a,c,d Problem 9.1-1(a,c)(P 246)	4	9.2.1 9.2.2
System of Linear equations,Example 30, 31Method of Reduction, Example 33 Exercise 2: 16, 17(i,ii,iii,iv,vi), 18,19 (only to solve system of equations using method of reduction)	2	**Ch-1** 1.34 1.52
Cramer's rule, Example 1, 3,6 Exercise 5 (P 399): 1 (a), (b), 5	3	(P 395)
Arithmetic and Geometric Progressions: **Arithmetic progression:** Definition, formula for nth term, sum to n terms, Arithmetic mean, Example 1, 2, 3,4,7,8,10,15 Exercise 1: 2, 4, 7,9 **Geometric progression:** Definition, formula for nth term, sum to n terms, geometric mean, Example 1,2, 7,18,26,27,30 Exercise: 2,17,19	2	**Ch-3** 3.1-3.4 3.26-3.28

Text Books:
1. C Sanchethi and V K Kapoor, Business Mathematics, Sulthan Chand & Sons Educational publishers, New Delhi, Eleventh Revised Edition
2. P. R. Vittal, Business Mathematics and Statistics, Margham Publications, Chennai,
3. PUNDIR & S.K. PUNDIR, A TEXT BOOK OF BCA MATHEMATICS-I, RIMPLE, A Pragatis Edition (IV).
4. B. S. Vatsa-Discrete Mathematics –New Age International Limited Publishers, New Delhi

Course Code: CAC01P	Course Title: **Information Technology Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03

Practice Tasks

1. Identification of the peripherals of a computer, components in a CPU and their functions.
2. Assembling and disassembling the system hardware components of personal computer.
3. Basic Computer Hardware Trouble shooting.
4. LAN and WiFi Basics.
5. Operating System Installation – Windows OS, UNIX/LINUX, Dual Booting.
6. Activities using word processing, presentation and spreadsheet software
7. Tasks involving Internet Browsing

REVISED PRACTICAL LIST
I SEM BCA
Information Technology Lab-CAC01P

SI. NO.	PROGRAM
1.	**Prepare a document using different formatting tools**

| 2. | **Prepare a document using SmartArt and Shapes tools**

To find the largest of three numbers

Organization Chart – Administration Faridabad Division

 |
|---|---|
| 3. | **Prepare a document with table to store sales details of a company for different quarters and calculate total, average and find maximum, minimum sales value.** |

Branch Code	Branch	Sales in Quarters				Total	Avg
		1	2	3	4		
A101	Mangalore	354690	244610	383290	413670		
A102	Udupi						
Total (Across Branches)							
Average (Across Branches)							
Highest Sales (Across Branches)							
Lowest Sales (Across Branches)							

TIME TABLE

Class : I BCA						Room No. 206	
Day	I	II	III	IV		V	VI
Monday							
Tuesday					L		
Wednesday					U		
Thursday					N C H		
Friday					B R E A K		
Saturday							***

4.	Prepare interview call letters for five candidates describing about the company and instructions about the interview. Use Mail merge feature.
1.	Create a presentation (minimum 5 slides) about your college. It should contain images, chart, Bulletted text, …..
2.	Create a presentation (minimum 5 slides) to advertise a product. The slides should be displayed automatically in a loop. Make use of Transition and Animations.
3.	A simple quiz program. Use hyperlinks to move to another slide in the presentation to display the result and correct answer/wrong answer status. Use at least four questions.
1.	Create a worksheet to maintain student information such as RollNo, Name, Class, Marks in three subjects of 10 students. Calculate total marks, average and grade. Find grade for Distinction, First class, Second class, Pass and Fail using normally used conditions. - Using custom sort, sort the data according to class Distinction first, First Class next, and so on.Within each class, average marks should be in descending order. - Also draw the Column Chart showing the RollNo versus Average scored.
2.	Prepare a worksheet to store details of Electricity consumed by customers. Details are Customer No, Customer Name, Meter No, Previous meter reading, Current meter reading of 10 customers. Calculate total number of units consumed and total amount to be paid by each consumer using following conditions: - If unit consumed is up to 30, charge is 100. 31 to 100 units, 4.70 per unit 101 to 200 units, 6.25 per unit - Above 200 units, 7.30 per unit. - Use Data validation to see that current reading is more than previous reading. - Arrange the records in the alphabetic order of names. - Filter the records whose bill amount is more than Rs.1500.

3.	Create Employee worksheet having EmpNo, EmpName, DOJ, Department, Designation and Basic Pay of 8 employees. Calculate DA, HRA, Gross Pay, Profession Tax, Net Pay, Provident Fund as per the rule
	• DA = 30% of basic pay
	• HRA = 10% of basic pay if basic pay is less than 25000, 15% of basic pay otherwise.
	• Gross =DA +HRA+ Basic pay
	• Provident fund =12% of Basic pay or Rs.2000, whichever is less.
	• Profession Tax= Rs.100 if Gross pay is less than 10000, Rs.200 otherwise.
	• NetPay = Gross - (Professional tax + Provident Fund)
	• Using Pivot table, display the number of employees in each department and represent it using Pie chart.

| 4. | Create a table COMMISSION containing the percentage of commission to be given to salesmen in different zones as follows: |

Zone	Percentage
South	10
North	12.5
East	14
West	13

Create another table SALES in the same worksheet to store salesman name, zone name, place, name of the
item sold, rate per unit, quantity sold. Calculate total sales amount of each salesman. Referring the
COMMISSION table, write the formula to compute the commission to be given.(Hint: Use if function and
absolute cell addresses)
Using advanced filtering show the result in other parts of the worksheet.
- Show the records of various zones separately.
- Show the records of only East and West zones.
- Display the details of the items sold more than 50, in South or North zones.

| 1. | Create Employee database and table Emp using MS ACCESS with following Structure. |

Emp no	Ename	Designation	Dep tno	DOJ	Basic Salary
101	RAMESH	MANAGER	10	10/10/2000	25000
102	SMITHA	CLERK	12	12/5/1999	15000
103	DEVIKA	ATTENDER	10	11/9/2001	12000
104	RAJESH	HR	15	15/4/2000	12000
105	GIRISH	SUPERVISOR	12	6/11/2005	18000
106	SATHYA	DRIVER	16	11/9/2001	11000
107	MANOJ	SWEEPER	10	22/6/2006	8000
108	BHOOMIKA	SECURITY	15	12/5/1999	10500
109	KIRAN	CLERK	14	11/9/2001	15000
110	PRATHIKSHA	SUPERVISOR	10	8/8/2005	18000

Perform following operation
a) List all the Employees Who are working in Dept no.10

b) List all the Employees who get less than 20000 Salary

c). Update Salary by adding the increments as per the following:-
     i.   10% Increment in Basic Salary who get < 20000
     ii.   5% Increment in Basic Salary who get >=20000.

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2. Create the " Order" database and a table "Orderdtl" having following records:

Order No	Order Date	Order Item	Order Qty	Order Price	Client Code	Delivery Type	Order Status
1011	12/02/2015	LED Monitors	100	750000	1025	Road	Delivered
1012	12/03/2015	CPU	12	500000	1026	SHIP	Not Delivered
1005	15/02/2014	Keyboard	80	48000	1027	Road	Delivered
1010	02/02/2016	LED Monitors	30	64000	1028	Flight	Delivered
1016	19/4/2015	Scanner	40	35000	1029	Road	Delivered
1009	9/05/2018	LED Monitors	25	125000	1030	Flight	Not Delivered
1008	13/8/2017	CPU	25	450000	1031	SHIP	Delivered
1014	1/7/2018	Printer	50	90000	1032	Road	Not Delivered

Execute following Query

a) Display all the Order No. which have not been yet Delivered.

b) Display all the Orders of LED Monitor and CPU.

c) Display all the Orders of LED Monitor and CPU which are not have been delivered yet.

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3. Create a "Stock" database having "Inventory" table:

Item Code	Item Name	Opening Stock(Qty)	Purchase(Qty)	Sale (Qty)	Closing Stock(Qty)	Remark
101	MONITOR	100	25	35		
102	PRINTER	75	40	15		
103	SCANNER	120	30	20		
104	CPU	50	35	10		
105	KEYBOARD	105	45	55		

Execute following Query

a) Calculate the closing stock of each item (Closing Stock = Opening Stock + Purchase – Sales)

b) Display all the Items which has closing stock < 100

c) If closing stock is less than 100 then set the remark as "Re-Order Level" otherwise "Enough Stock".

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Activity-1 from Part-A	Word Processing /Presentation	6 Marks
Activity-2 from Part-B	Spread Sheet	8 Marks
Activity-3 from Part-C	Acess	6 Marks
Practical Record		05 Marks
Total		25 Marks

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Course Code: CAC02P	Course Title: **C Programming Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03

REVISED I Sem BCA Practical LISTC Programming
Lab-CAC02P

SI. NO.	PROGRAM
	PART A
1	Program to find the roots of quadratic equation using else if ladder.
2	Program to read two integer values & a operator as character and perform basic arithmetic operations on them using switch case (+, -, *, / operations)
3.	Program to reverse a number and find the sum of individual digits. Also check for palindrome.
4.	Program to calculate and display the first 'n' Fibonacci numbers
5.	Program to find given number is a prime or not.
6.	Program to count occurrences of each character in a given string.
7.	Program to read string with alphabets, digits and special characters and convert upper case letters to lower case and vice a versa and retain the digits and special characters as it is.
8.	Program to search for number of occurances of number in a list of numbers using one-dimensional array also display its positions.
	PART-B
1.	Program to find the largest and smallest elements with their position in a one-dimensional array.
2.	Program to read 'n' integer values into a single dimension array and arrange them in ascending order using bubble sort method.
3.	Menu driven Program to perform addition and multiplication of two Matrices
4.	Program to find nCr and nPr using recursive function to caculate factorial.
5.	Program to read a string and count number of letters, digits, vowels, consonants, spaces and special characters present in it using user defiend function.
6.	Program sort a list of strings in ascending order using Pointers
7.	Program to enter the information of a student like name, register number, marks in three subjects into a structure and display total, average and grade Display details in a neat form.
8.	Program to input Name of the branches, Total sales of company into an array of structures. Display branch details in a tabular format. Also display the branch name that recorded the highest sales.

Evaluation Scheme for Lab Examination:

Assessment Criteria			
Program-1	PART-A Writing:4 Marks Execution:4Marks		8 Marks
Program-2	PART-B Writing:6 Marks Execution:6Marks		12 Marks
Practical Record			05 Marks
Total			25 Marks

MANGALORE UNIVERSITY

Choice Based Credit System Semester Scheme with Multiple Entry and Exit Options in the UG Programmes under NEP 2020

Bachelor of Computer Applications (BCA) Degree Programme

2021-2022 Onwards

II SEMESTER BCA

BLOWN UP SYLLABUS & PRACTICAL LISTS

Course Code: CAC04	Course Title: **Data Structures using C**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 02 Hours

Topics	Chapter No	Page No/Section
UNIT 1 [12 HOURS]		
Introduction to data structures: Introduction, Basic terminology; Elementary Data Organization, Data Structures, Data Structure Operations	Chapter -1	1.1 to 1.4
Introduction to Algorithms, **Preliminaries**: Introduction, Algorithmic notations, Control structure.	Chapter 2	2.1,2.3,2.4
Recursion: Definition; Recursion Technique Examples –Factorial, Fibonacci sequence, Towers of Hanoi.	Chapter 6	6.8,6.9(complexity excluded)
Arrays: Basic Concepts – Definition, Declaration, Initialization, Operations on arrays, Types of arrays, Representation of Linear Arrays in memory, Traversing linear arrays, Inserting and deleting elements, Multidimensional arrays- Two Dimensional Arrays Representation of two- dimensional arrays, Sparse matrices.	Chapter 4	4.1,4.2,4.4,4.5,4.6,4.10,4.17 4.7,
Sorting: Selection sort, Bubble sort, Quick sort, Insertion sort, Merge sort	Chapter 9	6.7,9.1,9.3,9.4,9.6 (complexity excluded)
UNIT 2 [10 HOURS]		
Searching : Definition, Sequential Search, Binary search	Chapter 4	4.8(complexity excluded in both 4.8 & 4.9),4.9,4.13

Dynamic memory management: Memory allocation and de-allocation functions - malloc, calloc, realloc and free. **Linked list**: Basic Concepts – Definition and Representation of linked list, Types of linked lists - Singly linked list, Doubly liked list, Header linked list, Circular linked list, Representation of Linked list in Memory; Operations on Singly linked lists– Traversing, Searching, Insertion, Deletion,Memory allocation, Garbage collection	Chapter 5	5.1,to 5.11,

UNIT 3 [10 HOURS]		
Stacks: Basic Concepts –Definition and Representation of stacks- Array representation of stacks, Linked representation of stacks, Operations on stacks, Applications of stacks, Infix, postfix and prefix notations, Conversion from infix to postfix using stack, Evaluation of postfix expression using stack, Application of stack in function calls. **Queues:** Basic Concepts – Definition and Representation of queues- Array representation of Queues, Linked representation of Queues, **Types of queues** - Simple queues, Circular queues, Double ended queues, Priority queues, Operations on queues	Chapter 6	6.1,6.2,6.3,6.4,6.5,6.6,6.7,6.10 6.11,6.12,6.13,6.14,6.15,6.16 (6.79,6.80,6.87 only),

UNIT IV [10 HOURS]		
Trees: Definition, Tree terminologies –node, root node, parent node, ancestors of a node, siblings, terminal & non-terminal nodes, degree of a node, level, edge, path, depth	Chapter 7	7.1,7.2,7.3,7.4,7.5,7.8,7.9
Binary tree: Type of binary trees - strict binary tree, complete binary tree, binary search tree,; Array representation of binary tree, Traversal of binary tree- preorder, inorder and postorder traversal **Graphs**: Terminologies, Matrix representation of graphs; Traversal: Breadth First Search and Depth first search.	Chapter 8	8.1,8.2,8.3,8.5,8.7

Text Book:		
1. Seymour Lipschutz, Data Structures with C, Schaum's Outlines Series, Tata McGraw Hill, 2011		

Course Code: CAC05	Course Title: **Object Oriented Programming with JAVA**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 02 Hours

Topics	Chapter No	Page No/Section
UNIT 1 [12 HOURS]		
Fundamentals of Object Oriented Programming: Introduction, Object Oriented Paradigm, Basic Concepts of OOP, Benefits and Applications of OOP.	Book 1 Chapter 1	1.1,1.2 , 1.3,1.4 ,1.5
Introduction to Java: Java Features, Java Environment, Simple Java Program, Java Program Structure, Java Tokens, Java Statements, Java Virtual Machine.	Book 1 Chapter2, Chapter 3	2.2 ,2.9 ,3.2 ,3.5,3.6,3.7,3.10
Java Programming Basics: Constants, Variables, Data Types, Declaration of variables, Giving values to the variable, Scope of variables, Symbolic constants, Type casting.	Book 1 Chapter 4	4.2 , 4.3,4.4 ,4.5,4.6,4.7,4.8,4.9
Operators and Expressions: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operator, Increment and Decrement Operators, Conditional Operator, Special Operators, Mathematical functions.	Book 1 Chapter 5	5.1,5.2,5.3,5.4,5.5,5.6,5.7, 5.9,5.15
Using I/O: Byte streams and character streams, predefined streams, reading console input, reading characters, strings, writing console output.	Book 2 Chapter 13	P.No 285,286,288-292
Decision Making & Branching: Simple if statement, if..else statement, nesting of if..else statement, the else..if ladder, the Switch statement.	Book 1 Chapter 6	6.1 to 6.7
UNIT 2 [10 HOURS]		
Decision making & Looping -The while statement, the do statement, the for statement . Jumps in loops, Labelled loops.	Book 1 Chapter 7	7.1 to 7.6
Class & Objects - Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The 'this' keyword, Overloading Methods, Using Objects as Parameters, Returning Objects, Recursion, Understanding 'static', Introducing 'final ', Using Command-Line Arguments, Varargs : Variable-Length Arguments	Book 2 Chapter 6, Book 2 Chapter 7	P.No 105 to 120 P.No 125 to 132 ,134-136,141-143 ,150-152

Arrays and Strings: One dimensional arrays, Creating an arrays, Two dimensional arrays , Strings, Vectors, Wrapper classes.	Book 1 Chapter 9	9.1 To 9.7

<table>
<tr><td colspan="3" align="center">UNIT 3 [10 HOURS]</td></tr>
<tr><td>Inheritance - Inheritance Basics, Using 'super', Creating Multilevel hierarchy, Method Overriding, Using Abstract Classes, Using final with Inheritance.</td><td>Book 2 Chapter 8</td><td>P.No 157 to 171 ,177 to 180</td></tr>
<tr><td>Packages & Interfaces - Packages, Access protection in packages, Importing Packages, Interfaces.</td><td>Book 2 Chapter 9</td><td>P.No 183 to 194</td></tr>
<tr><td>Exception Handling - Exception Handling Fundamentals – Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, finally, Java's builtin Exceptions</td><td>Book 2 Chapter 10</td><td>P.No 205 to 210,216-218</td></tr>
<tr><td>Multithreaded Programming- Introduction, Creating threads, Extending the thread class, stopping & blocking thread, Life cycle of a thread, Using thread methods, Implementing the runnable interface.</td><td>Book 1 Chapter 12</td><td>12.1 to 12.6 ,12.10</td></tr>
</table>

<table>
<tr><td colspan="3" align="center">UNIT IV [10 HOURS]</td></tr>
<tr><td>Event and GUI programming: The Applet Class, Types of Applets, Applet Basics, Applet Architecture, An Applet Skeleton, Simple Applet Display Methods, Requesting Repaint, The HTML APPLET tag.</td><td>Book 2 Chapter 21</td><td>P.No 617 to 625 ,629-630</td></tr>
<tr><td>Event Handling - The delegation event model, Event Classes –ActionEvent, KeyEvent & MouseEvent Classes, Event Listener Interfaces – ActionListener, KeyListener & MouseListener interfaces. Using the Delegation Event Model.</td><td>Book 2 Chapter 22</td><td>P.No 637 to 641 , 645-646,650-658</td></tr>
<tr><td>Window Fundamentals, Working with Frame Windows, Creating a Frame Window in an Applet. Creating a Windowed Program.</td><td>Book 2 Chapter 23</td><td>P.No 666-676</td></tr>
<tr><td>Introducing swing – two key swing features, components and containers, the swing packages, a simple swing application, event handling.</td><td>Book 2 Chapter 29</td><td>P.No 860,862-865,868</td></tr>
<tr><td>Exploring Swing- Jlabel, JTextField, JButton, Checkboxes , Radio buttons , Jlist , JComboBox.</td><td>Book 2 Chapter 30</td><td>P.No 879 to 884 ,887 to 891 ,895-900</td></tr>
</table>

Text Books :
1. E Balagurusamy, Programming with Java – A Primer, Fourth Edition, Tata McGraw Hill Education Private Limited.
2. Herbert Schildt, Java : The Complete Reference, Seventh Edition, McGraw Hill Publication.

Course Code: CAC06	Course Title: **Discrete Mathematical Structures**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 02 Hours

Contents	Book	Section/Subsections
Unit – 1 [12 Hours]		
Mathematical logic: Introduction, Statements and Notation, Connectives-Negation, Conjunction, Disjunction, Statement Formulas and Truth Tables, Example 1-3, Exercises (1-2.4-1,2,4), Page No. 1-14, Conditional and Biconditional, Example 1-5, Exercise 1-2.6-2,4, Well-formed Formulas, Tautologies, Exercise 1-2.8-1, Equivalence of Formulas, Example 1, Duality Law, Example 1, Tautological Implications Exercise 1-2.11-1,2,5, (Page No. 18-35), Predicates, Quantifiers (Page No. 80-85) (**Except** all theorems with proofs and algorithms in each subsection)	1	1-1, 1-2 (**Except** 1-2.5, 1-2.12, 1-2.13, 1-2.14, 1-2.15) 1-5.1, 1-5.2
Set Theory: Definition, notation, inclusion and equality of sets, the power set, Exercise 2-1.3-1,2,4, Page No 104-111, (except definition 2-1.7) Operations on sets, (All definitions with no proof), Example 1 3,5, Exercise 2-1.4 -2, 7, (Page No 111-115), Venn diagrams, Exercise 2-1.5-2 (Page No. 116-118) Ordered pairs, and n-tuples, Cartesian product, example 1, 2, Exercise 2-1-3,4 (Page No. 122-126)	1	2-1 (**Except** 2-1.6, 2-1.7)
Relations: Introduction, Example 1, Exercise 2-3.1-1 (Page No. 148-151,153) Properties of a binary relation in a set, Exercise 2-3.2-5 Relation matrix and graph of a relation, Example 1, 3 (Page No 154-159) Equivalence relations, example 1,2 (Page no. 164-165), compatibility relations, composition of Binary relations, Example 1,2,3,4, (Page No 176-179) (except definition 2-3.10, 2-3.12, 2-3.15, algorithm, and theorem 2-3.1, 2-3.2)	1	2-3 (**Except** 2-3.4)
Unit –2 [10 Hours]		
Partial Ordering: Definitions, lexicographic ordering, partially ordered set, Hasse diagram, Example 1,2(a, b, c), well ordered set (except definitions 2-3.18,2-3.19) Exercise 2-3.9-1 (Page No. 183-188,191)	1	2-3.8, 2-3.9,
Functions: Definition and introduction (except definition 2-4.2), graph of a function, types of functions, Exercise 2-4.1-5, Composition of functions, Example 1,2, Inverse functions,	1	2-4.1 to 2-4.3

Example 1, 2, Exercise 2-4.3-4 (Page No 192-205) (Theorems with no proofs)		
Counting: Basics of counting (Product rule, sum rule, the inclusion-exclusion principle), Example 1-5, 12, 13, 18, 19, Exercise- 1, 2, 3, (Page No 385-393, 396), Pigeonhole principle (Theorem-1 statement-no proof and corollary), Example 1, 2, 3, (Page No 399-400), Permutation and combination, Example 1,4,5,10, 12, 13 Exercise-1,4, (only theorem and corollary statements- no proof), Page No 407-413)	2	6-1, 6-2, 6-3

Unit –3 [10 Hours]

Discrete Probability: Introduction, finite probability, Example 1, 2, 4-6, (only theorem statements-no proof), (Page No 445-448), probabilities of complements and unions of events (except probability reasoning), Example 8, 9, (Page No 449-450), probability theory, Example 1, 2, (Page No 452-454), conditional probability, Example 3, 4, (Page no. 456-457), independence, Example 5,6,7 (except pairwise and mutual independence, Bernoulli Trials and the Binomial Distribution), (Page no. 457-458), Random variables, Example 10, 11, (Except Monte Carlo Algorithm and probabilistic method) (Page No 460), Bayes' theorem(no proof) , Example 2, 3,4, (Page No 470-474), Expected value and variance, Example 1,2 ,3 (Page No 477-479), (Except Linearity of Expectations, Average-Case Computational Complexity, The Geometric Distribution), Independent random variables, Example 11, 13,15 ,16 (Page no 485-489) (except Chebyshev's Inequality).	2	7.1, 7.2, 7.3, 7.4
Number Theory: Division algorithm, Example 1, 3, 4, 5 ,7 Theorem 2, 3, Modular arithmetic, (Page No. 237-239, 241-243), Primes and greatest common divisors, Definitions 1,2,3,5 Least common multiple, Example 1, 4, 10, 11, 12, 15, (Page No 257, 259, 265-266), The Euclidean algorithm, Example 16, Exercise 24, 32(a,b,c), (Page no. 267,272). (No theorems, lemma, corollary and proofs)	2	4.1, 4.3
Mathematical Induction: Mathematical Induction, principle of mathematical induction, Example 1, (Page No 311-313, 316), proving inequalities, Example 5, 6, (Page No 319-320), strong induction and well ordering (only statements), (Page No 334, 341)	2	5.1, 5.2

Unit –4 [10 Hours]

Graphs: Graphs and Graph models (Only definitions with example figures, Page No 641-643), Graph Terminology and Special Types of Graphs, Examples 1, 3, 4, 5,6,7, (Page No. 651-655), (only theorem statements, no proof) (Except Bipartite Graphs, Some Applications of Special Types of Graphs), Example 18, 19, (Page No 663-664), Representing Graphs and Graph Isomorphism, Example 1, 2, 3, 4, 5,6,7,8 (Page No. 668-672), Exercise (Page No 675-557) 1,3,5,7,10,13, Connectivity, (Page No 678-681,685-686), Definition 1,2, 3, 4, 5, Example 1,4,10 (Except all theorems and proofs of this section), Euler and Hamilton Paths, Definition 1,	2	10.1, 10.2, 10.3, 10.4, 10.5, 10.8

2, Example 1,2,5 (Page No 693-699), (**except** necessary and sufficient conditions for Euler circuits and paths, exclude all theorems and proofs of this section), Graph Coloring, Definition 1,2, Theorem 1(no proof), Example 1, (Page No. 727-729), Exercise 1,3 5,7, (Page No. 732).		
Trees: Directed tree, leaf node, branch node, ordered tree, degree of a node, forest, descendent, m-ary tree, conversion of directed tree into a binary tree. (Page No 494-500)	1	5-1.4

Text Books:

1. J.P. Trembley and R. Manobar, Discrete Mathematical Structures, McGraw Hill Education Private Limited, New Delhi,
2. Kenneth H. Rosen, Discrete Mathematics and Its Applications, Seventh Edition, 2012.

Course Code: CAC04P	Course Title: **Data Structure Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03 Hours

Part A

1. Program to sort the given list using selection sort technique.

2. Program to sort the given list using insertion sort technique.

3. Program to solve Tower of Hanoi using Recursion

4. Program to reverse String using Stack

5. Program to search an element using recursive binary search technique.

6. Program to implement Stack operations using arrays.

7. Program to implement Queue operations using arrays.

8. Program to implement dynamic array. Find smallest and largest element.

Part B

1. Program to sort the given list using merge sort technique.

2. Program to implement circular queue using array.

3. Program to sort the given list using quick sort technique.

4. Program to implement Stack operations using linked list.

5. Program to implement Queue operations using linked list.

6. Program to evaluate postfix expression.

7. Program to perform insert node at the end, delete a given node and display contents of single linked list.

8. Menu driven program for the following operations on Binary Search Tree(BST) of Integers

    (a) Create a BST of N Integers

    (b) Traverse the BST in Inorder, Preorder and Post Order

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program-1 from Part A	Writing the program	05
	Execution and formatting	03
Program-1 from Part B	Writing the program	08
	Execution and formatting	04
Practical Record		05
Total		25

Course Code: CAC05P	Course Title: **JAVA Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03 Hours

PART A

1. Program to accept student name and marks in three subjects. Find the total marks, average and grade (depending on the average marks).
2. Program, which reads two numbers having same number of digits. The program outputs the sum of product of corresponding digits.(Hint Input 327 and 539 output 3x5+2x3+7x9=84)
3. Program to input Start and End limits and print all Fibonacci numbers between the ranges.(Use for loop)
4. Define a class named Pay with data members String name, double salary, double da, double hra, double pf, double grossSal, double netSal and methods: Pay(String n, double s) - Parameterized constructor to initialize the data members, void calculate() - to calculate the following salary components, and void display() - to display the employee name, salary and all salary components.

    Dearness Allowance = 15% of salary

    House Rent Allowance = 10% of salary

    Provident Fund = 12% of salary

    Gross Salary = Salary + Dearness Allowance + House Rent Allowance

    Net Salary = Gross Salary - Provident Fund

    Write a main method to create object of the class and call the methods to compute and display the salary details.
5. Program to create a class DISTANCE with the data members feet and inches. Use a constructor to read the data and a member function Sum ( ) to add two distances by using objects as method arguments and show the result. (Input and output of inches should be less than 12.)
6. Program to create a class "Matrix" that would contain integer values having varied numbers of columns for each row. Print row-wise sum.
7. Program to extract portion of character string and print extracted string. Assume that 'n' characters extracted starting from mth character position.
8. Program to add, remove and display elements of a Vector

PART-B

1. Create a class named 'Member' having data members: *Name, Age, PhoneNumber, Place and Salary.* It also has a method named 'printSalary' which prints the salary of the members. Two classes 'Employee' and 'Manager' inherit the 'Member' class. The 'Employee' and 'Manager' classes have data members 'specialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an employee and a manager by making an object of both of these classes and print the same.
2. Program to implement the following class hierarchy:

    Student: id, name

    StudentExam (derived from Student): Marks of 3subjects, total marks

    StudentResult (derived from StudentExam) : percentage, grade

    Define appropriate methods to accept and calculate grade based on existing criteria and display details of N students
3. Program to calculate marks of a student using multiple inheritance implemented through interface. Class **Student** with data members rollNo, name, String **cls** and methods to set and put data. Create another class **test** extended by class Student with data members mark1, mark2, mark3 and methods to set and put data. Create interface sports with members sportsWt = 5 and putWt(). Now let the

class results extends class test and implements interface sports. Write a Java program to read required data and display details in a neat format.

4. Program to create an abstract class named shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Ellipse such that each one of the classes extends the class shape. Each one of the class contains only the method print Area() that print the area of the given shape.

5. Create a package to convert temperature in centigrade into Fahrenheit, and one more package to calculate the simple Interest. Implement both package in the Main () by accepting the required inputs for each application.

6. Program that implements a multi-threaded program has three threads. First thread generates a random integer every second, and if the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the value of cube of the number.

7. Program that creates a user interface to perform basic integer operations. The user enters two numbers in the TextFields - Num1 and Num2. The result of operations must be displayed in the Result TextField when the "=" button is clicked. Appropriate Exception handling message to be displayed in the Result TextFieldwhen Num1 or Num2 is not an integer or Num2 is Zero when division operation is applied.

8. Using the swing components, design the frame for shopping a book that accepts book code, book name, and Price. Calculate the discount on code as follows.

Code	Discount rate
101	15%
102	20%
103	25%
Any other	5%

Find the discount amount and Net bill amount. Display the bill.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Writing the Program	05
	Execution and Formatting	03
Program -2 from Part B	Writing the Program	08
	Execution and Formatting	04
Practical Record		05
Total		**25**

MANGALORE UNIVERSITY

National Education Policy – 2020
[NEP-2020]

Curriculum Structure for

Bachelor of Computer Application (B.C.A) Programme

Syllabus for III and IV semesters
And
Open Elective Courses

Curriculum for BCA

Sem	Core Courses	Hour / Week		DS Elective Courses	Hours/ Week
		Theory	Lab		
III	Database Management Systems	3			
	C# and DOT NET Framework	3			
	Computer Communication and Networks	3			
	LAB: DBMS		4		
	LAB: C# and DOT NET Framework		4		
IV	Python Programming	3			
	Computer Multimedia and Animation	3			
	Operating System Concepts	3			
	LAB: Multimedia and Animation		4		
	LAB: Python Programming		4		

Course Content for BCA: III and IV Semesters

Semester: III

Course Title: Database Management System	Course code: 21BCA3C7L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:

- Understand the various database concepts and the need for database systems.
- Identify and define database objects, enforce integrity constraints on a database using DBMS.
- Demonstrate a Data model and Schemas in RDBMS.
- Identify entities and relationships and design ER diagrams for given real-world problems.
- Represent ER model to relational model and its implementation through SQL.
- Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- Understand the transaction processing and concurrency control techniques.

DSC7: Database Management System (DBMS)

Contents	Hours
Unit-1	
Database Architecture: Introduction to Database system applications. Characteristics, Data models, Database schema, Database architecture, Data independence, Database languages, GUIs, and Classification of DBMS. **E-R Model:** E-R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, Roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram.	11
Unit-2	
Relational Data Model: Relational model concepts. Characteristics of relations. Relational model constraints: Domain constrains, key constraints, primary & foreign key constraints, integrity constraints and null values. **Data Normalization:** Functional dependencies. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.	11
Unit-3	
INTERACTIVE SQL: Table fundaments, oracle data types, CREATE TABLE command, Inserting data into table, Viewing Data in the table, sorting data in a table, Creating a table from a table, Inserting data into a table from another table, Delete operations, Updating the contents of a table, Modifying the structure of tables, Renaming tables, destroying tables, displaying table structure. **DATA CONSTRAINTS :** Types of data constraints, IO constraints-The PRIMARY KEY constraint, The FOREIGN KEY constraint, The UNIQUE KEY constraint, Business Rule Constraints- NULL value conceptsNOT NULL constraints, CHECK constraint, DEFAULT VALUE concepts. **COMPUTATIONS ON TABLE DATA:** Arithmetic Operators, Logical Operators, Range Searching, Pattern Matching, Oracle Table – DUAL, Oracle Function- Types, Aggregate Function, Date Conversion Function. GROUPING DATA FROM TABLES IN SQL, Group By clause, Having clause, subqueries, JOINS, Using the UNION, INTERSECTION, MINUS clause	10
Unit-4	
INTRODUCTION TO PL/SQL: Advantages of PL/SQL, The Generic PL/SQL Block, PL/SQL-The character set, Literals, PL/SQL datatypes, variables, Logical comparisons, Displaying User Messages on The VDU Screen, comments. Control Structure - Conditional Control, Iterative Control **PL/SQL Transactions:** Cursor-Types of Cursor, Cursor Attributes.Explicit cursor- Explicit cursor Management, cursor for loop **PL/SQL Database Objects:** Procedures and Functions, Oracle Packages, Error Handling in PL/SQL.	10

Text Book:
1. Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015

Reference Books:
2. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
3. Introduction to Database System, C J Date, Pearson, 1999.
4. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6th Edition, McGraw Hill, 2010.
5. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002

Course Title: C# and Dot Net Framework	Course code: 21BCA3C8L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):
At the end of the course, students will be able to:
- Understand Object Oriented Programming concepts like Inheritance and Polymorphism in C# programming language.
- Interpret and Develop Interfaces for real-time applications.
- Build custom collections and generics in C#.

DSC8: C# and Dot Net Framework

Contents	Hours
Unit-1	
Introduction to .Net Technologies: Introduction to Web Technologies. HTML Basics, Scripts. Sample Programs. Advantages and Disadvantages of Client-side and Server-side Scripts. Overview of Client-side Technologies and Server-side Technologies. **Introduction to C#:** Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Control Structures-Methods, Arrays, Strings, Structures, Enumerations	11
Unit-2	
OOPS with C#: Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading Delegates, Events, Errors and Exceptions. **Introduction to VB.NET:** Introduction, VB.NET -IDE – Start page, menu system, tool bars, New project dialog box, graphical designers, code designers, Intellisense, object browser, Toolbox, Solution explorer, property window, dynamic help window, component tray, server explorer, output window, task list, command window	11
Unit-3	
VB.NET Language: Basic Keywords. Data Types. VB.NET statements. Conditional statements: If Else, Select Case, Switch and Choose Loops: Do, For Next, For Each Next, While loop. Arrays. Subroutines and Functions in VB.NET. **Application Development on .NET: Vb.NET:** Windows Forms. **Working with Controls-** Textbox, Label, Button Timer, Picture-box, Group-box, Listbox , Combo-box, Horizontal and Vertical Scrollbar, Numeric-up-down, Track-bar, and Progress-bar. Building Windows Applications using C#	10
Unit-4	
Data Access Connectivity: ADO.NET: Introduction to ADO.NET, ADO vs ADO.NET Architecture: Data reader, Data adopter, Accessing Data with ADO.NET. Binding Controls to Databases: Various ways to bind the data, simple binding, complex binding, binding data to control. Programming Web Applications with Web Forms. Web Controls in C#, ASP.NET applications with ADO.NET.	10

References:
1. "Programming in C#", E. Balagurusamy, 4th Edition, Tata McGraw-Hill, 2017.
2. "Visual Basic.NET", Shirish Chavan, 3rd Edition, Pearson Education, 2009.
3. "ASP.NET and VB.NET Web Programming", Matt J. Crouch, Edition 2012.
4. "Computing with C# and the .NET Framework", Arthur Gittleman, 2nd Edition, Jones & Bartlett Publishers, 2011

Course Title: Computer Communication and Networks	Course code: 21BCA3C9L
Total Contact Hours: 42	Course Credits: 03
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:
- Explain the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
- Apply the basics of data communication and various types of computer networks in real world applications.
- Compare the different layers of protocols.
- Compare the key networking protocols and their hierarchical relationship in the conceptual model like TCP/IP and OSI.

DSC9: Computer Communication and Networks

Contents	Hours
Unit-1	
Introduction: Uses of Computer Networks and its Applications: Business Applications, Home Applications, Mobile Users, Social Issues. **Network Hardware**-Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks. **Reference Models**-The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP Reference Models.	11
Unit-2	
The Physical Layer: Transmission Media- Twisted Pair, Coaxial Cable, and Fiber Optics. **Wireless Transmission**- Radio Transmission, Microwave Transmission, Infrared, Light Transmission. Multiplexing-Frequency division, time division, code division, Switching. **The Data Link Layer:** Data link layer design issues-Services Provided to the Network Layer, Framing, Error Control, and Flow Control. Error Detection and Correction-Error-Correcting Codes, Error –Detecting Codes. Elementary Data Link Protocols-An Unrestricted Simplex Protocol, A Simplex Stop-and-Wait Protocol for an Error-Free Channel, A Simplex Protocol for a Noisy Channel. Sliding Window Protocols –A One Bit Sliding Window Protocol, A Protocol Using Go back n, A Protocol using Selective Repeat.	11
Unit-3	
The Network Layer: Network layer design issues-Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual Circuit and Datagram Networks. Routing Algorithms-Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Anycast Routing. Congestion Control Algorithms-Approaches to Congestion Control, Approaches to Congestion	10

Control, Admission Control. The network layer in the Internet-The IP Version 4 Protocol, IP Address, IP Version 6, Internet Control Protocol, The Interior Gateway Routing Protocol: OSPF, The Exterior Gateway Routing Protocol: BGP.	
Unit-4	
The Transport Layer: The Transport Service-Services Provided to the Upper Layers. Elements of Transport Protocols-Addressing, Connection Establishment, connection Release, Error control and Flow Control. The Internet Transport Protocols-(TCP and UDP)-UDP- Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols, TCP- Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Sliding Window, **The Application Layer:** DNS – Domain Name System-The DNS Name Space, Domain Resource Records, Name Servers. Electronic Mail-Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, The Word Wide Web- Architectural Overview,Static Web Pages, Dynamic Web Pages and Web Applications, HTTP—The HyperText Transfer Protocol	10

Text Book:
1. Computer Networks, Andrew S. Tanenbaum, 5th Edition, Pearson Education, 2010.

Reference Books:
1. Data Communication & Networking, Behrouza A Forouzan, 3rd Edition, Tata McGraw Hill, 2001.
2. Data and Computer Communications, William Stallings, 10th Edition, Pearson Education, 2017.
3. Data Communication and Computer Networks, Brijendra Singh, 3rd Edition, PHI, 2012.
4. Data Communication & Network, Dr. Prasad, Wiley Dreamtech.
5. http://highered.mheducation.com/sites/0072967757/index.htmls

Semester: IV

Course Title: Python Programming	Course code: 21BCA3C10L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:
- Explain the basic concepts of Python Programming.
- Demonstrate proficiency in the handling of loops and creation of functions.
- Identify the methods to create and manipulate lists, tuples and dictionaries.
- Discover the commonly used operations involving file handling.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Develop the emerging applications of relevant fields using Python.

DSC10: Python Programming

Contents	Hours
Unit-1	
Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. **Python Basics:** Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples. **Python Control Flow:** Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions. **Exception Handling:** Types of Errors; Exceptions; Exception Handling using try, except and finally. Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions	11
Unit-2	
Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifies; Escape Sequences; Raw and Unicode Strings; Python String Methods. **Lists:** Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists. **Dictionaries:** Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries. **Tuples and Sets:** Creating Tuples; Operations on Tuples; Built-in	11

Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods.	
Unit-3	
File Handling: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator. **Object Oriented Programming:** Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, Private Instance Variables; Polymorphism- Definition, Operator Overloading. **GU Interface:** The tkinter Module; Window and Widgets; Layout Management-pack, grid and place	10
Unit-4	
Python SQLite: The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on TablesInsert, Select, Update. Delete and Drop Records. **Data Analysis:** NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames. **Data Visualisation:** Introduction to Data Visualisation; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart	10

References:

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online @ https://www.greenteapress.com/thinkpython/thinkCSpy.pdf, 2015.

2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.

3. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, Apress®, 2015

4. Advance Core Python Programming, MeenuKohli, BPB Publications, 2021.

5. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall, 2012.

6. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015.

7. Data Structures and Program Design Using Python, D Malhotra et al., Mercury Learning and Information LLC, 2021.

8. http://www.ibiblio.org/g2swap/byteofpython/read/

9. https://docs.python.org/3/tutorial/index.html

Course Title: Computer Multimedia & Animation	Course code: 21BCA3C11L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:

- Write a well-designed, interactive Web site with respect to current standards and practices.
- Demonstrate in-depth knowledge of an industry-standard multimedia development tool and its associated scripting language.
- Determine the appropriate use of interactive versus standalone Web applications.

DSC11: Computer Multimedia & Animation

Contents	Hours
Unit-1	
Web Design: Origins and evolution of HTML, Basic syntax, Basic text markup, Images, Lists, Tables, Forms, Frame, Overview and features of HTML5. **CSS:** Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The and tags; Overview and features of CSS3. **JavaScript:** Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input.	11
Unit-2	
Animation: Introduction, Start and End States, Interpolation, Animations in HTML. All About CSS Animations, Creating a Simple Animation, Detailed Look at the CSS Animation Property, Keyframes, Declaring Multiple Animations, Wrap-up. All About CSS Transitions, Adding a Transition, Looking at Transitions in Detail, The Longhand Properties, Longhand Properties vs. Shorthand Properties, Working with Multiple Transitions.	11
Unit-3	
HTML5 – SVG: Viewing SVG Files, Embedding SVG in HTML5, HTML5 – SVG Circle, HTML5 – SVG Rectangle, HTML5 – SVG Line, HTML5 – SVG Ellipse, HTML5 – SVG Polygon, HTML5 – SVG Polyline, HTML5 – SVG Gradients, HTML5 – SVG Star	10
Unit-4	
HTML5 – CANVAS: The Rendering Context, Browser Support, HTML5 Canvas Examples, Canvas - Drawing Rectangles, Canvas - Drawing Paths, Canvas - Drawing Lines, Canvas - Drawing Bezier Curves, Canvas - Drawing Quadratic Curves, Canvas - Using Images, Canvas - Create Gradients, HTML5 - Styles and Colors, Canvas - Text and Fonts, Canvas - Pattern and Shadow, Canvas - Save and Restore States, Canvas - Translation, Canvas - Rotation, Canvas - Scaling, Canvas - Transforms, HTML5 Canvas - Composition, Canvas – Animations.	10

References:

1. The Complete Reference HTML and CSS, 5th Edition, Thomas A Powell, 2017.
2. Animation in HTML, CSS, and JavaScript, KirupaChinnathambi, 1st Edition, Createspace Independent Pub, 2013.
3. https://www.w3.org/Style/CSS/current-work#CSS3
4. http://bedford-computing.co.uk/learning/cascading-style-sheets-css/

Course Title: Operating System Concepts	Course code: 21BCA3C12L
Total Contact Hours: 42	Course Credits: 03
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):
 At the end of the course, students will be able to:

- Understand the fundamentals of the operating system.
- Comprehend multithreaded programming, process management, process synchronization, memory management and storage management.
- Compare the performance of Scheduling Algorithms
- Identify the features of I/O and File handling methods.

DSC12: Operating System Concepts

Contents	Hours
Unit-1	
Introduction to Operating System: Definition, History and Examples of Operating System; Types of Operating Systems; Functions of Operating System; Systems Calls; Operating System Structure. **File System:** File Concepts- Attributes, Operations and Types of Files; File System; File Access methods; Directory Structure; Protection; File System Implementation- File System Structure, Allocation Methods, Free Space Management.	10
Unit-2	
Memory Management: Logical and Physical Address Space; Swapping; Contiguous Allocation; Paging; Segmentation; Segmentation with Paging. **Virtual Memory:** Introduction to Virtual Memory; Demand Paging; Page Replacement; Page Replacement Algorithms; Allocation of frames, Thrashing **Disk Scheduling (I/O Management):** Introduction and Scheduling Algorithm	10
Unit-3	
Process Management: Process Concept- Process Definition, Process State, Process Control Block, Threads; Process scheduling- Multiprogramming, Scheduling Queues, CPU Scheduling, Context Switch; Operations on Processes- Creation and Termination of Processes; Inter process communication (IPC)- IPC Implementation Methods- Shared Memory and Message Passing; **CPU Scheduling:** Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling; Multiprocessor Scheduling; Real-Time CPU Scheduling	11
Unit-4	
Process Synchronization: Introduction; Race Condition; Critical Section Problem and Peterson's Solution; Synchronization Hardware, Semaphores; Classic Problems of Synchronization- Readers and Writers Problem, Dining	

Philosophers Problem; Monitors. **Deadlocks:** System Model; Deadlocks Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection; and Recovery from Deadlock. **Multithreaded Programming:** Introduction to Threads; Types of Threads; Multithreading- Definition, Advantages; Multithreading Models; Thread Libraries; Threading Issues.	**11**

Text Book:
1. Operating System Concepts, Silberschatz' et al., 10thEdition, Wiley, 2018.

Reference Books:
2. Operating System Concepts - Engineering Handbook, Ghosh PK, 2019.
3. Understanding Operating Systems, McHoes A et al., 7th Edition, Cengage Learning, 2014.
4. Operating Systems - Internals and Design Principles, William Stallings, 9th Edition, Pearson.
5. Operating Systems – A Concept Based Approach, Dhamdhere, 3rd Edition, McGraw Hill Education India.
6. Modern Operating Systems, Andrew S Tanenbaum, 4th Edition, Pearson

Skill Enhancement Course: SEC for other Programmes

Semester: III

Course Title: Artificial Intelligence	Course Credits: 2
Total Contact Hours: 13 hours of theory and 26 hours of practical	Duration of SEE: 01 Hour
Formative Assessment Marks: 20 marks	Summative Assessment Marks: 30 marks

Course Outcomes (COs):

At the end of the course, students will be able to:

- Appraise the theory of Artificial intelligence and list the significance of AI.
- Discuss the various components that are involved in solving an AI problem.
- Illustrate the working of AI Algorithms in the given contrast.
- Analyze the various knowledge representation schemes, Reasoning and Learning techniques of AI.
- Apply the AI concepts to build an expert system to solve the real-world problems.

Course Content

Contents	Hours
Unit-1	
Overview of AI: Definition of Artificial Intelligence, Philosophy of AI, Goals of AI, Elements of AI system, Programming a computer without and with AI, AI Techniques, History of AI. **Intelligent Systems:** Definition and understanding of Intelligence, Types of Intelligence, Human Intelligence vs Machine Intelligence.	05
Unit-2	
AI Applications: Virtual assistance, Travel and Navigation, Education and Healthcare, Optical character recognition, E-commerce and mobile payment systems, Image based search and photo editing. **AI Examples in daily life:** Installation of AI apps and instructions to use AI apps.	05
Unit-3	
Robotics: Introduction to Robotics, Difference in Robot System and Other AI Program, Components of a Robot.	03

Laboratory Activities:
 ● Amazon Alexa:
   https://play.google.com/store/apps/details?id=com.amazon.dee.app&hl=en&am p;gl=US
 ● Google Lens:
 https://play.google.com/store/search?q=google+lens&c=apps&hl=en&gl=US
 ● Image to Text to Speech ML OCR:
   https://play.google.com/store/apps/details?id=com.mlscanner.image.text.s peech& hl=en_IN&gl=US
 ● Google Pay:
   https://play.google.com/store/apps/details?id=com.google.android.apps.nb u.paisa .user&hl=en_IN&gl=US
	26

- Grammarly:
  https://play.google.com/store/search?q=grammarly&c=apps&hl=en_IN&gl=
- Google Map:
  https://play.google.com/store/search?q=google+maps&c=apps&hl=en&gl=US
- FaceApp:
  https://play.google.com/store/apps/details?id=io.faceapp&hl=en_IN&gl=US
- Socratic:
  https://play.google.com/store/apps/details?id=com.google.socratic&hl=en_IN&gl =US
- Google Fit: Activity Tracking:
  https://play.google.com/store/apps/details?id=com.google.android.apps.fitness&h l=en_IN&gl=US
- SwiftKey Keyboard:
  https://swiftkey-keyboard.en.uptodown.com/android
- E-commerce App:
  https://play.google.com/store/apps/details?id=com.jpl.jiomart&hl=en_IN&gl=US

Text Book:

1. Wolfgang Ertel, "Introduction to Artificial Intelligence", 2nd Edition, Springer International Publishing 2017.
2. Michael Negnevitsky, "Artificial Intelligence A Guide to Intelligent Systems", 2nd Edition, Pearson Education Limited 2005.

Reference Books:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_tutorial.pdf
2. Kevin Knight, Elaine Rich, Shivashankar B. Nair, "Artificial Intelligence", 3rd Edition, July 2017.

Reference Links:

1. Voice Assistant: https://alan.app/blog/voiceassistant-2/

2. Browse with image: https://www.pocket-lint.com/apps/news/google/141075-what-isgoogle-lens-and-how-does-it-work-and-which-devices-have-it

3. OCR: https://aws.amazon.com/what-is/ocr/

4. Mobile Payment system: https://gocardless.com/en-us/guides/posts/how-do-mobilepayment-systems-work/

5. Grammarly: https://techjury.net/blog/how-to-use-grammarly/#gref

6. Travel & Navigation: https://blog.google/products/maps/google-maps-101-ai-powernew-features-io-2021/

7. AI in photo editing: https://digital-photography-school.com/artificial-intelligencechanged-photo-editing/

8. AI in education: https://www.makeuseof.com/what-is-google-socratic-how-does-itwork/

9. AI in health and fitness: https://cubettech.com/resources/blog/implementing-machinelearning-and-ai-in-health-and-fitness/

10. E-commerce and online shopping: https://medium.com/@nyxonedigital/importanceof-e-commerce-and-online-shopping-and-why-to-sell-online-5a3fd8e6f416

Question Paper Pattern for Skill Enhancement Course

Artificial Intelligence

Duration: 1 Hour   Max. Marks: 30

Part-A

(This section shall contain four questions from each module. Each question carries one mark)

Module-1:

1.

2.

3.

4.

Module-2:

5.

6.

7.

8.

Module-3:

9.

10.

11.

12.

Part-B

(This section shall contain two full questions from each module having an internal choice. Each full question carries six marks)

Module-1:

(a) Six mark question with sub-questions **OR** (b) Six mark question with sub-questions

Module-2:

(a) Six mark question with sub-questions **OR** (b) Six mark question with sub-questions

Module-3:

(a) Six mark question with sub-questions **OR** (b) Six mark question with sub-questions

Course Title: **Programming in C Concepts**	Course Credits: 3 (3L+0T+0P)
Semester: III	Duration of SEE: 02 Hours
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

Course Outcomes (COs):
After completing this course satisfactorily, a student will be able to:

- Read, understand and trace the execution of programs written in C language
- Write the C code for a given problem
- Perform input and output operations using programs in C
- Write programs that perform operations on arrays
- Understand functions and file concepts of C language

Course Contents:

Contents	Hours
Unit-1	
Overview of C: Importance of C Program, Basic structure of a C-program, Execution of a C Program. **C Programming Basic Concepts:** Character set, Tokens, Keywords, Constants, Symbolic constants, Variables, Data types, **Input and output with C:** Formatted I/O functions – *printf* and *scanf,* control stings and escape sequences,output specifications with *printf* functions; Unformatted I/O functions to read and display single character and astring-*getchar, putchar, gets* and *puts* functions.	11
Unit-2	
Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Operator Precedence and Associatively; Evaluation of arithmetic expressions; **Control Structures:** Decision Making and Branching -Decision making with if statement, simple if statement, the if else statement, nesting of if…else statements, the else if ladder, the switch statement, ?: operator, the go to statement.	11
Unit-3	
Looping Structures: Decision making and looping - The while statement, the do statement, for statement, nested loops, exit, break, Jumps in loops. **Derived data types in C:** Arrays-declaration, initialization and access of one-dimensional and two-dimensional arrays.	10

Unit -4	
Handling of Strings: Declaring and initializing string variables, reading strings from terminal, writing strings to screen, String handling functions - *strlen, strcmp, strcpy, strstr and strcat;* Character handling functions - *toascii, toupper, tolower, isalpha, isnumeric.* **Functions:** Basics of functions, Parameter Passing, Simple functions **File handling:** Basics of file programming concepts- fprintf and fscanf, and example programs	**10**

Text Book:

1. E.Balagurusamy, Programming in ANSI C ,7th Edition, Tata McGraw Hill

Reference Books:

2. Herbert Scheldt, C: The Complete Reference, 4th Edition.
3. Brian W. Kernighan and Dennis Ritchie, The C Programming Language, Second Edition.

Open Elective for III Semester: R Programming

Course Title: R PROGRAMMING	Course Credits: 3 (3L+0T+0P)
Semester: III	Duration of SEE: 02 Hours
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

Course Outcomes (COs):

- Understand the basics of Fundamentals of R.
- Understands the loading, retrieval techniques of data.
- Understand how data is analyzed and visualized using statistic functions.

Course Contents:

Contents	Hours
Unit-1	
Introduction to R: Basics, Advantages of R over Other Programming Languages - R Studio: R command Prompt, R script file, Comments – Handling Packages in R: Installing R Package, Commands: installed.packages(), package Description(), help(), find. Package (), library() - Input and Output – Entering Data from keyboard – Printing fewer digits or more digits – Special Values functions : NA, Inf and –inf. **R Data Types**: Vectors, Lists, Matrices, Arrays, Factors, Data Frame **R - Variables**: Variable assignment, Data types of Variable, Finding Variable ls(), Deleting Variables.	**11**
Unit-2	
R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators **R Decision Making**: if statement, if – else statement, if – else if statement, switch statement **R Loops**: repeat loop, while loop, for loop - Loop control statement: break statement, next statement. **R-Functions** : function definition, Built in functions: mean(), paste(), sum(), min(), max(), seq(), user-defined function, calling a function, calling a function without an argument, calling a function with argument values **R-Strings** – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower() **R Vectors** – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting **R List** - Creating a List, List Tags and Values, Add/Delete Element to or from a List, Size of List, Merging Lists, Converting List to Vector **R Matrices** – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division	**11**

Unit-3	
R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements **R Factors** –creating factors, generating factor levels gl(). **Data Frames** –Create Data Frame, Data Frame Access, Understanding Data in Data Frames: dim(), nrow(), ncol(), str(), Summary(), names(), head(), tail(), edit() functions - Extract Data from Data Frame **Expand Data Frame**: Add Column, Add Row - Joining columns and rows in a Data frame rbind() and cbind() – Merging Data frames merge() – Melting and Casting data melt(), cast().	**10**
Unit-4	
Loading and handling Data in R: **Getting and Setting the Working Directory** – getwd(), setwd(), dir() **R-CSV Files** - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File **R -Excel File** – Reading the Excel file.	**10**

Text Book:

1. Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN : 978-93-5260-455-5.

Reference Books:

2. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.

3. Tutorials Point (I) simply easy learning, Online Tutorial Library (2018), R Programming, Retrieved from https://www.tutorialspoint.com/r/r_tutorial.pdf.

4. Andrie de Vries, JorisMeys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8.

Open Elective for IV Semester: Python Programming Concepts

Course Title: **Python Programming Concepts**	Course Credits: 3 (3L+0T+0P)
Semester: IV	Duration of SEE: 02 Hours
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

Course Outcomes (COs):

- Explain the basic concepts of Python Programming.
- Demonstrate proficiency in handling of loops and the creation of functions.
- Identify the methods to create and manipulate string data types.
- Understand the notion of arrays, lists, tuples and their applications

Course contents:

Contents	Hours
Unit-1	
Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments;	**10**
Unit-2	
Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples; Illustrative programs; Libraries for graphics and image handling. **Python Control Flow:** Types of Control Flow; Control Flow Statements-if, else, elif, while loop, break, continue statements, for loop Statement; range() and exit () functions; Illustrative programs.	**10**
Unit-3	
Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods; Illustrative programs. **Other data types:** Basics of arrays, lists, tuples and related functions	**11**
Unit-4	
Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Illustrative programs	**11**

Text Book:

1. Python Programming: Using Problem Solving Approach, Reema Thareja, June 2017.

Reference Books:

1. Learning with Python, Allen Downey, Jeffrey Elkner, Chris Meyers, 2015 (Freely available online 2015. @https://www.greenteapress.com/thinkpython/thinkCSpy.pdf)

2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.

3. http://www.ibiblio.org/g2swap/byteofpython/read/

4. http://scipy-lectures.org/intro/language/python_language.html

5. https://docs.python.org/3/tutorial/index.html

Course Title: E-Commerce	Course Credits: 3 (3L+0T+0P)
Semester: IV	Duration of SEE: 02 Hours
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

Course Outcomes (COs):

- Compare how internet and other information technologies support business processes.
- Demonstrate an overall perspective of the importance of application of internet technologies in business administration
- Explain the basic business management concepts.
- Demonstrate the basic technical concepts relating to E-Commerce.
- Identify the security issues, threats and challenges of E-Commerce.

Course Contents:

Contents	Hours
Unit-1	
Introduction to E-Commerce and Technology Infrastructure Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5**,** Building an E-Commerce Website, Mobile Site and Apps **Systematic approach to build an E-Commerce:** Planning, System Analysis, System Design, Building the system, Testing the system, Implementation and Maintenance, Optimize Web Performance – Choosing hardware and software – Other E-Commerce Site tools – Developing a Mobile Website and Mobile App	**11**
Unit-2	
E-Commerce Security and Payment Systems E-Commerce Security Environment – Security threats in E-Commerce – Technology Solutions: Encryption, Securing Channels of Communication, Protecting Networks, Protecting Servers and Clients – Management Policies, Business Procedure and Public Laws - Payment Systems	**11**
Unit-3	
Business Concepts in E-Commerce Digital Commerce Marketing and Advertising strategies and tools – Internet Marketing Technologies – Social Marketing – Mobile Marketing – Location based Marketing – Ethical, Social, Political Issues in E-Commerce	**10**
Unit-4	
Project Case Study Case Study: Identify Key components, strategy, B2B, B2C Models of E-commerce Business model of any e-commerce website - Mini Project : Develop E-Commerce project in any one of Platforms like Woo-Commerce, Magento or Opencar	**10**

Text Book:

1. Kenneth C. Laudon, Carol Guercio Traver - E-Commerce, Pearson, 10th Edition, 2016

Reference Books:

1. http://docs.opencart.com/

2. http://devdocs.magento.com/

3. http://doc.prestashop.com/display/PS15/Developer+tutorials

4. RobbertRavensbergen, ―Building E-Commerce Solutions with Woo Commerce‖, PACKT, 2nd Edition.