

MANGALORE UNIVERSITY



State Education Policy – 2024
[SEP-2024]

CURRICULUM STRUCTURE

FOR

BCA

BACHELOR OF COMPUTER APPLICATIONS

MANGALORE UNIVERSITY

Suggested programme structure for the Under Graduate Programmes

[BCA, BCA (A.I & M.L), BCA (D.A)]

Semester	Course 1	Course 2	Course 3	Elective / Optional	Course	Language	Compulsory	Total Credit	Total Working hour
I	5 (3T+2P)	5 (3T+2P)	5 T			3+3	2	23	4+4+4+4+5+4+4+2=31
II	5 (3T+2P)	5 (3T+2P)	5T			3+3	2	23	4+4+4+4+5+4+4+2=31
III	5 (3T+2P)	5 (3T+2P)	5T	2		3+3		23	4+4+4+4+5+4+4+2=31
IV	5 (3T+2P)	5 (3T+2P)	5T	2		3+3	2	25	4+4+4+4+5+2+4+4+2=33
V	8[(2x3T)+2P]]	8[(2x3T)+2P]]	8[(2x3T)+2P]				2	26	3+3+4+3+3+4+3+3+4+2=32
VI	3T	3T	3T		3T	Project work 12		24	3+3+3+3+24=36
								144	

Note:

- **Course1 and Course2: I to IV Semester: Theory 3 credit=4 contact hours & Practical 2 credit=4 contact hours**
- **Course3: I to IV Semester: Theory 5 credit=5 contact hours**
- **Course1, Course2 and Course3: V and VI Semester: Theory 3 credit=3 contact hours& Practical 2 credit=4 contact hours**
- **Elective/Optional: 2 credit=2 contact hours**
- **Languages: 3 credit=4 contact hours**
- **Compulsory: 2 credit=2 contact hours**

CURRICULUM STRUCTURE FOR I TO VI SEMETER BCA

Semester I								
Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SEE	IA	Total Marks	Credits
1		Fundamentals of Computers	Theory	4	80	20	100	3
2		Information Technology Lab	Practical	4	40	10	50	2
3		Programming in C	Theory	4	80	20	100	3
4		C Programming Lab	Practical	4	40	10	50	2
5		Discrete Mathematics for Computer Applications	Theory	5	80	20	100	5
Semester II								
6		Data Structures	Theory	4	80	20	100	3
7		Data Structures Lab	Practical	4	40	10	50	2
8		Object Oriented Programming using Java	Theory	4	80	20	100	3
9		Object Oriented Programming Lab	Practical	4	40	10	50	2
10		Computational Mathematics	Theory	5	80	20	100	5

Semester I								
Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SE E	IA	Total Marks	Credits
1		Language-I	Lang	4	80	20	100	3
2		Language-II	Lang	4	80	20	100	3
3	BCA -1.1	Fundamentals of Computers	Core	4	80	20	100	3
4	BCA -1.2	Programming in C	Core	4	80	20	100	3
5	BCA -1.3	Discrete Mathematics for Computer Applications	Core	5	80	20	100	5
6	BCA -1.4	Information Technology Lab	practical	4	40	10	50	2
7	BCA -1.5	C Programming Lab	practical	4	40	10	50	2
8		Constitution/Values	Compulsory	2	40	10	50	2
Sub - Total				31	520	130	650	23

Semester II								
Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SE E	IA	Total Marks	Credits
1		Language-I	Lang	4	80	20	100	3
2		Language-II	Lang	4	80	20	100	3
3	BCA –2.1	Data Structures	Core	4	80	20	100	3
4	BCA –2.2	Object Oriented Programming using Java	Core	4	80	20	100	3
5	BCA –2.3	Computational Mathematics	Core	5	80	20	100	5
6	BCA –2.4	Data Structures Lab	practical	4	40	10	50	2
7	BCA –2.5	Object Oriented Programming Lab	practical	4	40	10	50	2
8		Constitution/Values	Compulsory	2	40	10	50	2
Sub - Total				31	520	130	650	23

Semester III								
Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SEE	IA	Total Marks	Credits
1		Language-I	Lang	4	80	20	100	3
2		Language-II	Lang	4	80	20	100	3
3	BCA –3.1	Database Management System	Core	4	80	20	100	3
4	BCA -3.2	C# and Dotnet Framework	Core	4	80	20	100	3
5	BCA –3.3	Computer Networks	Core	5	80	20	100	5
6	BCA –3.4	Database Management System Lab	practical	4	40	10	50	2
7	BCA –3.5	C# and Dotnet Framework Lab	practical	4	40	10	50	2
8	BCA –3.6	A) Open Source Tools B) Web Content Management System C) DEVOPS	Elective	2	40	10	50	2
Sub - Total				31	520	130	650	23

Semester IV								
Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SEE	IA	Total Marks	Credits
1		Language-I	Lang	4	80	20	100	3
2		Language-II	Lang	4	80	20	100	3
3	BCA –4.1	Python Programming	Core	4	80	20	100	3
4	BCA -4.2	AdvancedJAVA andJ2EE	Core	4	80	20	100	3
5	BCA –4.3	Operating System Concepts	Core	5	80	20	100	5
6	BCA –4.4	Python Programming Lab	practical	4	40	10	50	2
7	BCA –4.5	AdvancedJAVA andJ2EELab	practical	4	40	10	50	2
8	BCA –4.6	A) Distributed Computing B) Object Oriented Analysis & Design C) Digital Image Processing	Elective	2	40	10	50	2
9	BCA –4.7	Internet Basics	Compulsory	2	40	10	50	2
Sub - Total				33	560	140	700	25

Semester V								
Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SEE	IA	Total Marks	Credits
1	BCA –5.1	Software Engineering	Core	3	80	20	100	3
2	BCA –5.2	Web Development	Core	3	80	20	100	3
3	BCA –5.3	Design Analysis and Algorithm	Core	3	80	20	100	3
4	BCA –5.4	Statistical Computing and R Programming	Core	3	80	20	100	3
5	BCA –5.5	Cloud Computing	Core	3	80	20	100	3
6	BCA –5.6	Cryptography and Network Security	Core	3	80	20	100	3
7	BCA –5.7	Design Analysis and Algorithm Lab	Practical	4	40	10	50	2
8	BCA –5.8	R ProgrammingLab	Practical	4	40	10	50	2
9	BCA –5.9	Web Development Lab	Practical	4	40	10	50	2
10	BCA –5.10	Data Analytics using Excel	Compulsory	2	40	10	50	2
Sub - Total				32	640	160	800	26

Semester VI								
Sl. No	Course Code	Title of the Course	Category of Courses	Teaching Hours per Week	SEE	IA	Total Marks	Credits
1	BCA- 6.1	Artificial Intelligence and Applications	Core	3	80	20	100	3
2	BCA- 6.2	Principles Cyber Security	Core	3	80	20	100	3
3	BCA- 6.3	Fundamentals of Data Science	Core	3	80	20	100	3
4	BCA- 6.4	Digital Marketing	Core	3	80	20	100	3
4	BCA- 6.5	Project Work	Project Work	24	300	100	400	12
Sub - Total				36	620	180	800	24

SEMESTER - I

Program Name	BCA	Semester	I
Course Title	Fundamentals of Computers(Theory)		
Course Code:	BCA-1.1	No.of Credits	03
Contact hours	4 Hours per week	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the fundamentals of computer system
- Identify different components within the computer system
- Understand different types of input and output devices
- Demonstrate the working concepts of different devices connected to computer
- Explain different generations of programming languages and their significance
- Understand the use of Word processing, Spreadsheet, Presentation and DBMS applications
- Understand Digital computer and digital systems functioning

Unit	Description	Hours
1	Computer Basics: Introduction, Characteristics computers, Evolution computers, Generations of computers, Classification of computers, the computer system, Application of computers. Computer Architecture: Introduction, Central processing unit- ALU, Registers, Control unit, system bus, main memory unit, cache memory Input devices: Introduction, Types of input devices, Keyboard, Mouse, Track ball, Joystick light pen, Touch screen and track pad. Speech recognition, digital camera, webcam, flatbed scanner Output devices: Types of output, Classification of output	13

	devices, Printers–Dot matrix, Ink-jet, Laser, Hydra, Plotter, Monitor – CRT, LCD, Differences between LCD and CRT	
2	<p>Computer software: Introduction, software definition, relationship between software and hardware, software categories</p> <p>Computer programming languages: Introduction, developing a program, Program development cycle, Types of programming languages, generation of programming languages, Features of a good programming language.</p> <p>Problem Solving techniques: Introduction, Problem solving procedure.</p> <p>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)</p> <p>Flowcharts: Definition, advantages, Symbols used in flow charts. Flowcharts for simple problems mentioned in algorithms. Psuedocode.</p>	13
3	<p>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.</p> <p>Boolean Algebra: Basic definitions, Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra, Venn diagram.</p>	13
4	<p>Digital logical gate: Boolean functions, Canonical and Standard forms, Minterms, Maxterms, other logic operations, Digital logic gates, Universal gates.</p> <p>Simplification of Boolean function: The map method, Two and three variable maps, Four variable maps, Don't care conditions, Product of sum simplification.</p>	13
<p>Text Books:</p> <ol style="list-style-type: none"> 1. ITL Education Solution Limited, Introduction to Information Technology, Second Edition, Pearson 2. M. Morris Mano, Digital Logic and Computer design, PHI, 2015 		

References 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 Brookshear, Computer Science: An Overview, Twelfth Edition, Addison-Wesley
4. R.G. Dromey, How to solve it by Computer, PHI.

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe- Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Program Name	BCA	Semester	I
Course Title	Programming in C(Theory)		
Course Code:	BCA-1.2	No.of Credits	03
Contact hours	4 Hours per week	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Confidently operate Desktop Computers to carry out computational tasks
- Understand working of Hardware and Software and the importance of operating systems
- Understand programming languages, number systems, peripheral devices, networking, multimedia and internet concepts
- 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

Unit	Description	Hours
1	<p>Overview of C: History of C, Importance of C Program, Basic structure of a C-program, Execution of C Program.</p> <p>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.</p> <p>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.</p>	13

2	<p>Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associativity; Evaluation of arithmetic expressions; Type conversion.</p> <p>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.</p>	13
3	<p>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.</p> <p>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.</p> <p>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.</p> <p>Recursion: Definition, example programs.</p> <p>Storage classes : Automatic, Global, Static, Register.</p>	13
4	<p>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.</p> <p>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</p> <p>File Handling in C: Create in Read/Write and Append mode, copying file.</p>	13

	The Pre-processor: Macro substitution, file inclusion.	
<p>Text Book:</p> <ol style="list-style-type: none"> 1. E. Balagurusamy, Programming in ANSI C, 7th Edition, Tata McGraw Hill <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Herbert Schildt, C: The Complete Reference, 4th Edition 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 BookHouse 		

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Program Name	BCA	Semester	I
Course Title	Discrete Mathematics for Computer Applications(Theory)		
Course Code:	BCA-1.3	No.of Credits	05
Contact hours	5 Hours per week	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Study and solve problems related to connectives, predicates and quantifiers under different situations.
- Understand the basic concepts of Discrete Probability.
- To develop the knowledge about derivatives and know various applications of differentiation.
- Understand the Applications of Discrete Mathematics in Modelling Computation.
- Understand the basic concepts of Mathematical reasoning, set and functions

Unit	Description	Hours
1	Mathematical logic: Introduction, statements, Connectives, negation, conjunction, disjunction, statement formulas and truth tables, conditional and bi Conditional statements, tautology, contradiction, equivalence of formulas, duality law, Predicates and Quantifiers, arguments, joint Daniel Sets: Definition, notation, inclusion and equality of sets, the power set, Operations on sets,Venn diagram, ordered pairs, and n-tuples, Cartesian product,	15

	<p>Relations: Introduction, properties of a binary relation in a set, Relation matrix and graph of a relation, equivalence relations, compatibility relations, composition of Binary relation</p>	
2	<p>Partial Ordering: Definition, lexicographic ordering, Partially ordered set, Hasse diagram, well-ordered set</p> <p>Functions: Definition and introduction, types of functions, composition of functions, inverse functions</p> <p>Counting: Basics of counting, Pigeonhole principle, Permutation and combination, Generalized Permutations and Combinations, generating permutation and combination, inclusion and exclusion</p>	15
3	<p>Discrete Probability: Introduction, finite probability, probabilities of complements and unions of events, probability theory, conditional probability, independence, random variables, Bayes' theorem, expected value and variance, independent random variable.</p> <p>Mathematical Induction: Mathematical Induction, principle of mathematical induction, proving inequalities, strong induction and well ordering</p> <p>Number Theory: Division algorithm, Modular arithmetic, primes and greatest common divisors, least common multiple, the Euclidean algorithm</p>	15
4	<p>Graphs: Graphs and Graph models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.</p> <p>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.</p> <p>Applications of Discrete Mathematics in Modelling Computation: Language and Grammars – Introduction, Phrase-Structured, Types, Derivation Trees; Finite State Machines with Output – Introduction, Finite State Machines, Types; Finite State Machines without Output - Introduction, Set of Strings, Finite State Automata, Language Recognition by FSM; Language Recognition – Introduction; Turing Machine – Introduction, Definition</p>	15

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.
3. Bernard Kolman, Robert C, Busby, Sharon Ross, Discrete Mathematical Structure, 2003.
4. C. L. Liu, D. P, Mohapatra, Elements of Discrete Mathematics, 4th Edition McGraw Hill Education Private Limited, New Delhi.

Reference Books:

1. D C Sanchethi and V K Kapoor, Business Mathematics, Eleventh Revised Edition, Sulthan Chand & Sons Educational publishers, New Delhi,
2. Narsingh Deo, Graph Theory with Applications to Engg and Comp. Sci, PHI, 1986.
3. Ralph P. Grimaldi, B. V. Ramatta, Discrete and Combinatorial Mathematics, 5th Edition, Pearson, Education
4. K Chandrashekhara Rao, Discrete Mathematics, Narosa Publishing House, New Delhi

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gy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe-Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Program Name	BCA-	Semester	I
Course Title	Information Technology Lab		
Course Code:	BCA-1.4	No. of Credits	02
Contact hours	4 Hours per week	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

PART -A: MS WORD

1. Prepare a document using different formatting tools

Highlights of the National Education Policy (NEP) 2020



Note for Students

From UPSC perspective, the following things are important :

Prelims level : National Education Policy

Mains level : Need for imbuing competitiveness in Indian education system

New Policy aims for **universalization of education** from pre-school to secondary level with 100 % Gross Enrolment Ratio (GER) in school education by 2030. NEP 2020 will bring 2 crores out of school children back into the mainstream through the open schooling system.

- ❖ The current 10+2 system to be replaced by a **new 5+3+3+4 curricular structure** corresponding to ages 3-8, 8-11, 11-14, and 14-18 years respectively. **This will bring the hitherto uncovered age group of 3-6 years under the school curriculum, which has been recognized globally as the crucial stage for the development of mental faculties of a child.**
- ❖ The new system will have 12 years of schooling with three years of Anganwadi/ pre-schooling.
 - Emphasis on Foundational Literacy and Numeracy, no rigid separation between academic streams, extracurricular, vocational streams in schools; Vocational Education to start from Class 6 with Internships
 - Teaching up to at least Grade 5 to be in mother tongue/ regional language. No language will be imposed on any student.
- Assessment reforms with **360° Holistic Progress Card**, tracking Student Progress for achieving Learning Outcomes
- A new and comprehensive National Curriculum Framework for Teacher Education, NCFTE 2021, will be formulated by the NCTE in consultation with NCERT.
- By 2030, the minimum degree qualification for teaching will be a 4-year integrated B.Ed. degree.
- Gross Enrolment Ratio in higher education to be raised to **50% by 2035; 3.5 crore seats to be added in higher education.**
- The policy envisages broad-based, multi-disciplinary, holistic Under Graduate Program with flexible curricula, creative combinations of subjects, integration of vocational education and multiple entries and exit points with appropriate certification.
- **Academic Bank of Credits to be established to facilitate Transfer of Credits**

Multidisciplinary Education and Research Universities (MERUs), at par with IITs, IIMs, to be set up as models of best multidisciplinary education of global standards in the country.

Affiliation of colleges is to be **phased out in 15 years** and a stage-wise mechanism is to

be established for granting graded autonomy to colleges.

Over a period of time, it is envisaged that every college would develop into either an Autonomous degree-granting College or a constituent college of a university.

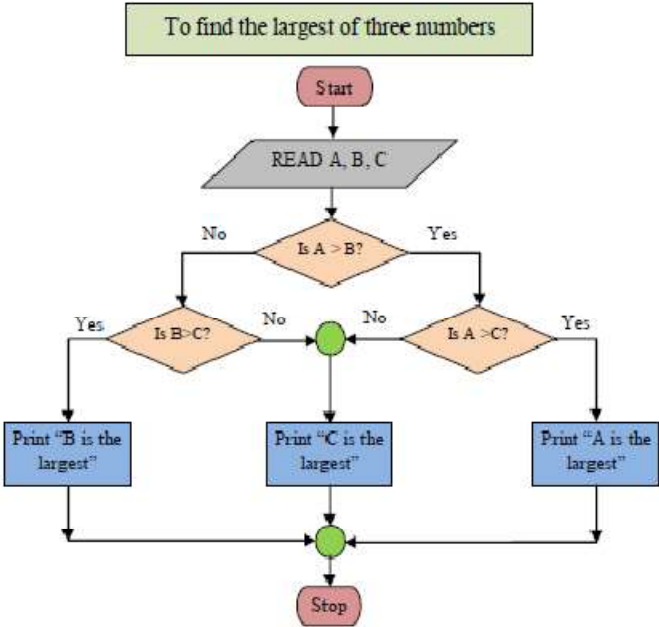
$$\frac{df}{dt} = \lim_{h \rightarrow 0} \frac{f(t+h) - f(t)}{h}$$

$$(a + b)^2 = a^2 + 2ab + b^2$$

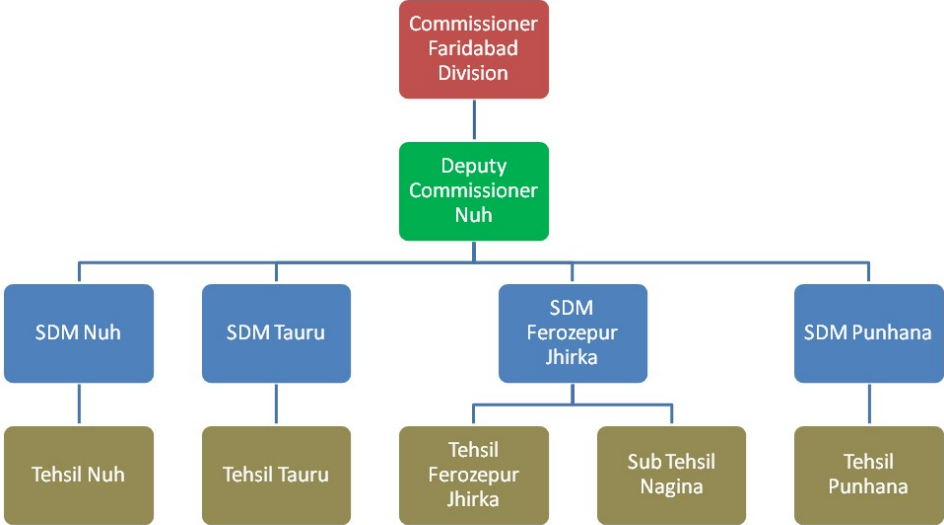
$$(a - b)^2 = (a + b)^2 - 4ab$$

$$a^2 + b^2 = (a - b)^2 + 2ab$$

2. Prepare a document using SmartArt and Shapes tools



Organization Chart – Administration Faridabad Division



4. Prepare interview call letters for five candidates describing about the company and instructions about the interview. Use Mail merge feature

Interview call Letter Format

Date:

[Name of the candidate]

[Address]

Dear [name of the candidate]

This is to the reference of your application for the job [name of the job] indicating interest in seeking employment in our organisation. We thank you for the same.

We would like to inform you that your profile is being shortlisted for the job role and is best suited for it. Therefore, we would like to take a face to face interview with you on [date of interview] at [venue details].

We hope that the venue is suitable for you. If not please get in touch with us, so that we can arrange the date and venue according to your availability.

The company will reimburse you all the expenses incurred by you for this interview. This letter has an attachment in which you need to fill the details and carry it along on the date of interview. Please carry your CV also along with you.

Kindly confirm your availability for the date and venue. If there are any changes to be done, please contact us at phone number: [999xxxx999] and email id: abcnd@mail.com.

We look forward to seeing you.

Regards,

Name of the Manager

Designation Name

Company name

PART-B: MS POWERPOINT

1. Create a presentation (minimum 5 slides) about your college. It should contain images, chart, Bulleted text... The slides should be displayed automatically in a loop.
2. 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.

[Navigation must be done by hyperlink]

3. Create a presentation for a business proposal (minimum 5 slides).
 - Slides must include company logo in header
 - A title slide with table of contents
 - financial data of the company in the table
 - Company sales and profit in charts
 - Make use of animation and transition
4. Create a presentation for a college project (minimum 5 slides).
 - Master slide
 - Add comments for each slide
 - Add Audio and video to the slide
 - Add header and footer.
 - Add source citation
 - Make use of animation and transition

[Presentation must include title slide, Module Design, Chart, references]

PART-C: MS EXCEL

(Note: Give proper titles, column headings for the worksheet. Insert 10 records for each exercise in such a way to get the result for all the conditions. Format the numbers appropriately wherever needed).

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.

(Note: Worksheet creation and formatting 3 marks, calculations: 3 marks, sorting: 2 marks, chart: 2 marks)

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.

(Note: Worksheet creation and formatting 2 marks, Data validation: 2 marks, calculations: 2 marks, sorting: 2 marks, filtering: 2 marks)

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.

(Note: Worksheet creation and formatting 2 marks, calculations: 3 marks, Pivot table: 3 marks, Chart: 2 marks)

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.

(Note: Worksheet creation and formatting: 2 marks, calculations: 2 marks, filtering: 6 marks)

PART-D: MS ACCESS

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.
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.

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”.

4. Create a “Company” database having “Sales” table with fields saleid, quarter, product, no_of_sales.

Perform the followings:

- a. Design a form to insert records to Sales table
- b. Generate a report to display Sales details of product based on quarters.

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	MS WORD	8Marks
Program-2	MS POWERPOINT	7 Marks
Program-3	MS EXCEL	10
Program-4	MS ACCESS	10

Practical Record	05 Marks
Total	40 Marks

Program Name	BCA	Semester	I
Course Title	C Programming Lab		
Course Code:	BCA-1.5	No.of Credits	02
Contact hours	4 Hours per week	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

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 occurrences 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 calculate factorial.
5. Program to read a string and count number of letters, digits, vowels, consonants, spaces and special characters present in it using user defined 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. Write a menu driven program to
 - a. Create a text file
 - b. Append the contents of a text file to another existing file by accepting filenames
 - c. Display the content of entered filename
 - d. Exit

Create two text files during the execution of the program. Display their contents. Perform Appending. Display the contents again. Always check for the existence of the inputted file names.

Evaluation Scheme for Lab Examination:

Assessment Criteria		
Program-1	PART-A Writing:7 Marks Execution:8Marks	15Marks
Program-2	PART-B Writing:10 Marks Execution:10 Marks	20 Marks
Practical Record		05 Marks

Total	40 Marks
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SEMESTER- II

Program Name	BCA	Semester	II
Course Title	Data Structures(Theory)		
Course Code:	BCA-2.1	No.of Credits	03
Contact hours	4 Hours per week	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
- Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs
- Write programs that use arrays, linked structures, stacks, queues, trees, and graphs
- Demonstrate different methods for traversing trees

- Compare alternative implementations of data structures with respect to performance
- Describe the concept of recursion, give examples of its use
- Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

Unit	Description	Hours
1	<p>Introduction to data structures: Introduction, Basic terminology; Elementary Data Organization, Data Structures, Data Structure Operations</p> <p>Introduction to Algorithms, Preliminaries: Introduction, Algorithmic notations, Control structure.</p> <p>Recursion: Definition; Recursion Technique Examples – Factorial, Fibonacci sequence, Towers of Hanoi.</p> <p>Arrays: Basic Concepts – Definition, Declaration, Initialisation, 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.</p> <p>Sorting: Selection sort, Bubble sort, Quick sort, Insertion sort, Merge sort</p>	13
2	<p>Searching: Definition, Sequential Search, Binary search</p> <p>Dynamic memory management: Memory allocation and de-allocation functions - malloc, calloc, realloc and free.</p> <p>Linked list: Basic Concepts – Definition and Representation of linked list, Types of linked lists - Singly linked list, Doubly linked 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</p>	13
3	<p>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.</p> <p>Queues: Basic Concepts – Definition and Representation of</p>	13

	queues- Array representation of Queues, Linked representation of Queues, Types of queues - Simple queues, Circular queues, Double ended queues, Priority queues, Operations on queues	
4	<p>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</p> <p>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</p> <p>Graphs: Terminologies, Matrix representation of graphs; Traversal: Breadth First Search and Depth first search.</p>	13
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Seymour Lipschutz, Data Structures with C, Schaum’s Outlines Series, Tata McGraw Hill, 2011 2. R. Venkatesan and S. Lovelyn Rose, Data Structures, First Edition: 2015, Wiley India Pvt. Ltd. Publications <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Computer Science Press, 1982. 2. Aaron M. Tenenbaum , Data structures using C, First Edition, Pearson Education 3. Kamathane, Introduction to Data structures, Pearson Education , 2004 4. Y. Kanitkar, Data Structures Using C, Third Edition, BPB 5. Padma Reddy: Data Structure Using C, Revised Edition 2003, Sai Ram Publications. 6. Sudipa Mukherjee, Data Structures using C – 1000 Problems and Solutions, McGraw Hill Education, 2007 		

Pedagogy:
Lecture/
PPT/
Videos
/
Animations/
Role
Plays/
Think-

Pair-Share/ Predict-Observe- Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Program Name	BCA	Semester	II
Course Title	Object Oriented Programming using Java(Theory)		
Course Code:	BCA-2.2	No.of Credits	03
Contact hours	4 Hours per week	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

- Understand the features of Java and the architecture of JVM
- Write, compile, and execute Java programs that may include basic data types and control flow constructs and how type casting is done
- Identify classes, objects, members of a class and relationships among them needed for a specific problem and demonstrate the concepts of polymorphism and inheritance
- The students will be able to demonstrate programs based on interfaces and threads and explain the benefits of JAVA's Exceptional handling mechanism compared to other Programming Language
- Write, compile, execute Java programs that include GUIs and event driven programming and also programs based on files

Unit	Description	Hours
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1	<p>Fundamentals of Object Oriented Programming: Introduction, Object Oriented Paradigm, Basic Concepts of OOP, Benefits and Applications of OOP.</p> <p>Introduction to Java: Java Features, Java Environment, Simple Java Program, Java Program Structure, Java Tokens, Java Statements, Java Virtual Machine.</p> <p>Java Programming Basics: Constants, Variables, Data Types, Declaration of variables, Giving values to the variable, Scope of variables, Symbolic constants, Type casting.</p> <p>Operators and Expressions: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operator, Increment and Decrement Operators, Conditional Operator, Special Operators, Mathematical functions.</p> <p>Using I/O: Byte streams and character streams, predefined streams, reading console input, reading characters, strings, writing console output.</p> <p>Decision Making & Branching: Simple if statement, if..else statement, nesting of if..else statement, the else..if ladder, the Switch statement..</p>	13
2	<p>Decision making & Looping -The while statement, the do statement, the for statement . Jumps in loops, Labelled loops.</p> <p>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</p> <p>Arrays and Strings: One dimensional arrays, Creating an arrays, Two dimensional arrays , Strings, Vectors, Wrapper classes.</p>	13
3	<p>Inheritance - Inheritance Basics, Using ‘super’, Creating Multilevel hierarchy, Method Overriding, Using Abstract Classes, Using final with Inheritance.</p> <p>Packages & Interfaces - Packages, Access protection in packages, Importing Packages, Interfaces.</p> <p>Exception Handling - Exception Handling Fundamentals – Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, finally, Java’s builtin Exceptions</p>	13

4	<p>Multithreaded Programming- Introduction, Creating threads, Extending the thread class, stopping & blocking thread, Life cycle of a thread, Using thread methods, Implementing the runnable interface.</p> <p>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. Event Handling - The delegation event model, Event Classes ActionEvent, KeyEvent & MouseEvent Classes, Event Listener Interfaces – ActionListener, KeyListener & MouseListener interfaces. Using the Delegation Event Model. Window Fundamentals, Working with Frame Windows, Creating a Frame Window in an Applet. Creating a Windowed Program, Displaying information within a window.</p> <p>Introducing swing – two key swing features, components and containers, the swing packages, a simple swing application, event handling. Exploring Swing- JLabel, JTextField, JButton, Checkboxes , 13 Radio buttons , Jlist , JComboBox.</p>	13
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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.

Reference Books:

1. Herbert Schildt, Java 2-TheCompleteReference,Fifth Edition, McGrawHill publication.
2. CayS. Horstmann, Core Java VolumeI–Fundamentals, Prentice Hall.
3. Somashekara, M.T., Guru, D.S., Manjunatha, K.S, Object Oriented Programming with Java, EEE Edition, PHI.

**Ped
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gy:**
Lect
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PPT
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eos/

Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe- Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/ Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Program Name	BCA	Semester	II
Course Title	Computational Mathematics (Theory)		
Course Code:	BCA-2.3	No.of Credits	05
Contact hours	5 Hours per week	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	20	Summative Assessment Marks	80

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Obtain an intuitive and working understanding of numerical methods for the basic problems of numerical analysis.
- Gain experience in the implementation of numerical methods using a computer.
- Trace error in these methods and need to analyse and predict it.
- Provide knowledge of various significant and fundamental concepts to inculcate in the students an adequate understanding of the application of Statistical Methods.
- Demonstrate the concepts of numerical methods used for different applications

Unit	Description	Hours
1	<p>Computer Arithmetic: Number System, Number representation, Floating point Arithmetic.</p> <p>Errors in numerical computation - Errors and their computation</p> <p>Solution of Algebraic and Transcendental equations: Introduction, the Bisection method, the method of False position, the Iterative method, Newton-Raphson method, Ramanujan's method.</p> <p>Interpolation: Introduction Finite differences- forward differences, backward differences, Central differences, Newton's formula for interpolation, Languages interpolation formula.</p> <p>Divided differences- Newton's general interpolation formula</p>	15
	<p>Least Squares - Introduction, least squares curve fitting procedures - fitting a straight line, non-linear curve fitting,</p>	

2	curve fitting by a sum of exponentials Numerical differentiation and integration - Numerical differentiation, Integration- Trapezoidal rule, Simpson's 1/3 rule and Simpson's 3/8 rule.	15
3	Matrices and linear system of equations: Basic definitions, matrix operations, transpose of a matrix, the inverse of a matrix, matrix norms. Solution of linear system: Direct methods- Matrix inversion method, Gaussian elimination method, Gauss-Jordan method, LU decomposition. Solution of linear systems- Iterative methods- Gauss-Seidal methods, Jacobi's method.	15
4	Numerical solution of ordinary differential equations: Solution by Taylor's series, Euler's method, Modified Euler's method, Runge-Kutta methods, Predictor-corrector methods - Adams-Moulton method, Milne's method, Boundary value problems- Finite difference method.	15
<p>Text Book: 1. S.S. Sastry, Numerical Analysis, 3rd edition, PHI publication.</p> <p>Reference Books: 1. M. K. Jain, S.R.K. Iyengar & R. K. Jain, Numerical methods for Scientific and Engineering computation, 5th edition, New Age International publishers. 2. V Rajaraman, Computer Oriented Numerical Methods, 3rd Edition, PHI, 2006</p>		

Pedagogy: Lecture/ PPT/ Videos/ Animations/ Role Plays/ Think-Pair-Share/ Predict-Observe- Explain/ Demonstration/ Concept mapping/ Case Studies examples/ Tutorial/ Activity/ Flipped Classroom/ Jigsaw/ Field based Learning/ Project Based Learning/

Mini Projects/ Hobby Projects/ Forum Theatre/ Dance/ Problem Based Learning/ Game Based Learning/ Group Discussion/ Collaborative Learning/ Experiential Learning / Self Directed Learning etc.

Program Name	BCA	Semester	II
Course Title	Data Structures Lab		
Course Code:	BCA-2.4	No.of Credits	02
Contact hours	4 Hours per week	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

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		
Program-1	PART-A Writing:7 Marks Execution: 8Marks	15 Marks
Program-2	PART-B Writing:10 Marks Execution:10Marks	20 Marks
Practical Record		05 Marks
Total		40Marks

Program Name	BCA	Semester	II
Course Title	Object Oriented ProgrammingLab		
Course Code:	BCA-2.5	No.of Credits	02
Contact hours	4 Hours per week	Duration of SEA/Exam	3 Hours
Formative Assessment Marks	10	Summative Assessment Marks	40

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 $3 \times 5 + 2 \times 3 + 7 \times 9 = 84$)
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. [class basics]

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. [inheritance]
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. Write a Program to calculate marks of a student using multiple inheritance implemented through interface. Class Student with data members rollNo, name, Stringcls 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. Write a 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.[Abstract class].
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. Write a 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.[Multithreading]
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 TextField when 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		
Program-1	PART-A	15 Marks
	Writing:7 Marks Execution: 8Marks	

Program-2	PART-B Writing:10 Marks Execution:10Marks	20 Marks
Practical Record		05 Marks
Total		40 Marks

Questions Paper for Pattern Core Subjects

Duration:3 Hours

Max.Marks:80

Note: Answer any ten Questions from Part-A. And one full Questions from each unit in Part-B

Part-A

1.

10*2=20

- a.
- b.
- c.
- d.
- e.
- f.
- g.
- h.
- i.
- j.
- k.
- l.

Part-B

UNIT-I, II, III, IV

Each unit contains two main questions and it carry 15 Marks.

Each main questions contain 3 or more sub question.

4*15=60

UNIT-I

2.

- a.
- b.
- c.

3.

- a.
- b.
- c.

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	
<p>Database Architecture: Introduction to Database system applications. Characteristics, Data models, Database schema, Database architecture, Data independence, Database languages, GUIs, and Classification of DBMS.</p> <p>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.</p>	11
Unit-2	
<p>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.</p> <p>Data Normalization: Functional dependencies. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.</p>	11
Unit-3	
<p>INTERACTIVE SQL:Table fundamentals, 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.</p> <p>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.</p> <p>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</p>	10
Unit-4	
<p>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.</p> <p>Control Structure - Conditional Control, Iterative Control</p> <p>PL/SQL Transactions:Cursor-Types of Cursor, Cursor Attributes.Explicit cursor- Explicit cursor Management, cursor for loop</p> <p>PL/SQL Database Objects: Procedures and Functions, Oracle Packages, Error Handling in PL/SQL.</p>	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	
<p>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,</p> <p>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 World Wide Web- Architectural Overview,Static Web Pages, Dynamic Web Pages and Web Applications, HTTP–The HyperText Transfer Protocol</p>	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://highereducation.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	
<p>File Handling: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator.</p> <p>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.</p> <p>GU Interface: The tkinter Module; Window and Widgets; Layout Management- pack, grid and place</p>	10
Unit-4	
<p>Python SQLite: The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables Insert, Select, Update. Delete and Drop Records.</p> <p>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.</p> <p>Data Visualisation: Introduction to Data Visualisation; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart</p>	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	
<p>Introduction to Operating System: Definition, History and Examples of Operating System; Types of Operating Systems; Functions of Operating System; Systems Calls; Operating System Structure.</p> <p>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.</p>	10
Unit-2	
<p>Memory Management: Logical and Physical Address Space; Swapping; Contiguous Allocation; Paging; Segmentation; Segmentation with Paging.</p> <p>Virtual Memory: Introduction to Virtual Memory; Demand Paging; Page Replacement; Page Replacement Algorithms; Allocation of frames, Thrashing</p> <p>Disk Scheduling (I/O Management): Introduction and Scheduling Algorithm</p>	10
Unit-3	
<p>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;</p> <p>CPU Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling; Multiprocessor Scheduling; Real-Time CPU Scheduling</p>	11
Unit-4	
<p>Process Synchronization: Introduction; Race Condition; Critical Section Problem and Peterson's Solution; Synchronization Hardware, Semaphores; Classic Problems of Synchronization- Readers and Writers Problem, Dining</p>	

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

<p>Laboratory Activities:</p> <ul style="list-style-type: none"> • 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.speech&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
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- **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&hl=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-is-google-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>

Open Source Tools

(Skill Enhancement Course: SEC for BCA Course)

Semester: III

Course Title: Open Source Tools	Course Credits: 2 (1L+0T+2P)
Semester: III	Duration of SEE: 01 Hour
Total Contact Hours: 13 hours of theory and 26-28 hours of practicals	SEE: 30 Marks IA: 20 Marks

Course Outcomes (COs):

- Recognize the benefits and features of Open Source Technology and to interpret, contrast and compare open source products among themselves
- Use appropriate open source tools based on the nature of the problem
- Write code and compile different open-source software.

Course Content: Open Source Tools

Module	Details	Duration
Module 1: Open Source Softwares	<ul style="list-style-type: none">• Introduction to Open sources, Need of Open Sources, Open Source –Principles, Standard Requirements, Advantages of Open Sources –• Free Software – FOSS• Licenses – GPL, LGPL, Copyrights, Patents, Contracts & Licenses and Related Issues• Application of Open Sources. Open Source Operating Systems : FEDORA, UBUNTU	05 hours
Module 2: Programming Tools And Techniques	<ul style="list-style-type: none">• Usage of design Tools like Argo UML or equivalent• Version Control Systems like Git or equivalent• Bug Tracking Systems (Trac, BugZilla)• BootStrap	04hours
Module 3: Case Studies	<ul style="list-style-type: none">• Apache• Berkeley Software Distribution• Mozilla (Firefox)• Wikipedia• Joomla• GNU Compiler Collection• Libre Office	04 hours

Text Book:

1. KailashVadera, Bhavyesh Gandhi, “Open Source Technology”, Laxmi Publications Pvt. Ltd 2012, 1st Edition.

Reference Book:

1. Fadi P. Deek and James A. M. McHugh, “Open Source: Technology and Policy”, Cambridge Universities Press 2007.

Question Paper Pattern for Skill Enhancement Course

Artificial Intelligence and Open Source Tools

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

Open Elective for III Semester: Programming in C

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	
<p>Overview of C: Importance of C Program, Basic structure of a C-program, Execution of a C Program.</p> <p>C Programming Basic Concepts: Character set, Tokens, Keywords, Constants, Symbolic constants, Variables, Data types,</p> <p>Input and output with C: Formatted I/O functions – <i>printf</i> and <i>scanf</i>, control stings and escape sequences, output specifications with <i>printf</i> functions; Unformatted I/O functions to read and display single character and astring-<i>getchar</i>, <i>putchar</i>, <i>gets</i> and <i>puts</i> functions.</p>	11
Unit-2	
<p>Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Operator Precedence and Associativity; Evaluation of arithmetic expressions;</p> <p>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.</p>	11
Unit-3	
<p>Looping Structures: Decision making and looping - The while statement, the do statement, for statement, nested loops, exit, break, Jumps in loops.</p> <p>Derived data types in C: Arrays-declaration, initialization and access of one-dimensional and two-dimensional arrays.</p>	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 - *tolower*, *toupper*, *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 Schildt, 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	
<p>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.</p> <p>R Data Types: Vectors, Lists, Matrices, Arrays, Factors, Data Frame</p> <p>R - Variables: Variable assignment, Data types of Variable, Finding Variable Is(), Deleting Variables.</p>	11
Unit-2	
<p>R Operators: Arithmetic Operators, Relational Operators, Logical Operator, Assignment Operators, Miscellaneous Operators</p> <p>R Decision Making: if statement, if – else statement, if – else if statement, switch statement</p> <p>R Loops: repeat loop, while loop, for loop - Loop control statement: break statement, next statement.</p> <p>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</p> <p>R-Strings – Manipulating Text in Data: substr(), strsplit(), paste(), grep(), toupper(), tolower()</p> <p>R Vectors – Sequence vector, rep function, vector access, vector names, vector math, vector recycling, vector element sorting</p> <p>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</p> <p>R Matrices – Accessing Elements of a Matrix, Matrix Computations: Addition, subtraction, Multiplication and Division</p>	11

Unit-3	
<p>R Arrays: Naming Columns and Rows, Accessing Array Elements, Manipulating Array Elements, Calculation Across Array Elements</p> <p>R Factors –creating factors, generating factor levels gl().</p> <p>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</p> <p>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().</p>	10
Unit-4	
<p>Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir()</p> <p>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</p> <p>R -Excel File – Reading the Excel file.</p>	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>

Open Elective for IV Semester: E-COMMERCE

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 Opencart	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 Commercell, PACKT, 2nd Edition.