KUVEMPU UNIVERSITY

NEP-2021

CURRICULUM STRUCTURE AND SYLLABUS

Bachelor of Computer Application (Basic and Honors) Programmes as Major and Minor Courses

And

Open Elective courses in Computer Applications

w.e.f Academic Year 2021-22 onwards

The objectives of the BCA Program

1. The primary objective of this program is to provide a foundation of computing principles and business practices for effectively using/managing information systems and enterprise software
2. It helps students analyze the requirements for system development and exposes students to business software and information systems
3. This course provides students with options to specialize in legacy application software, system software or mobile applications
4. To produce outstanding IT professionals who can apply the theoretical knowledge into practice in the real world and develop standalone live projects themselves
5. To provide opportunity for the study of modern methods of information processing and its applications.
6. To develop among students the programming techniques and the problem-solving skills through programming
7. To prepare students who wish to go on to further studies in computer science and related subjects.
8. To acquaint students to Work effectively with a range of current, standard, Office Productivity software applications

Program Outcomes: BCA (3 Years) Degree

1. **Discipline knowledge:** Acquiring knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity
2. **Problem Solving:** Improved reasoning with strong mathematical ability to Identify, formulate and analyze problems related to computer science and exhibiting a sound knowledge on data structures and algorithms.
3. **Design and Development of Solutions:** Ability to design and development of algorithmic solutions to real world problems and acquiring a minimum knowledge on statistics and optimization problems. Establishing excellent skills in applying various design strategies for solving complex problems.
4. **Programming a computer:** Exhibiting strong skills required to program a computer for various issues and problems of day-to-day applications with thorough knowledge on programming languages of various levels.
5. **Application Systems Knowledge**: Possessing a sound knowledge on computer application software and ability to design and develop app for applicative problems.
6. **Modern Tool Usage:** Identify, select and use a modern scientific and IT tool or technique for modeling, prediction, data analysis and solving problems in the area of Computer Science and making them mobile based application software.
7. **Communication:** Must have a reasonably good communication knowledge both in oral and writing.
8. **Project Management:** Practicing of existing projects and becoming independent to launch own project by identifying a gap in solutions.
9. **Ethics on Profession, Environment and Society:** Exhibiting professional ethics to maintain the integrality in a working environment and also have concern on societal impacts due to computer-based solutions for problems.
10. **Lifelong Learning:** Should become an independent learner. So, learn to learn ability.
11. **Motivation to take up Higher Studies:** Inspiration to continue educations towards advanced studies on Computer Science.

Additional Program Outcomes: BCA Degree (Hons)

The Bachelor of Computer Application (BCA (Hons)) program enables students to attain following additional attributes besides the afore-mentioned attributes, by the time of graduation:

1. Apply standard Software Engineering practices and strategies in real -time software project development
2. Design and develop computer programs/computer -based systems in the areas related to AI, algorithms, networking, web design, cloud computing, IoT and data analytics.
3. Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems
4. The ability to apply the knowledge and understanding noted above to the analysis of a given information handling problem.
5. The ability to work independently on a substantial software project and as an effective team member.

Curriculum for BCA

Sem	Core Courses	Hour / Week		DS Elective Courses	Hous/ Week
		Theory	Lab		
1	i. Fundamentals of Computers ii. Programming in C iii. Mathematical Foundation iv. LAB: Information Technology v. LAB: C Programming	3 3 3	 4 4		
2	i. Discrete Mathematical Structures ii. Data Structures using C iii. Object Oriented Concepts using JAVA iv. LAB: Data Structure v. LAB: JAVA Lab	3 3 3	 4 4		
3	i. Data Base Management Systems ii. C# and DOT NET Framework iii. Computer Communication andNetworks iv. LAB: DBMS v. LAB: C# and DOT NET Framework	3 3 3	 4 4		
4	i. Python Programming ii. Computer Multimedia and Animation iii. Operating Systems Concepts iv. LAB: Multimedia and Animation v. LAB: Python programming	3 3 3	 4 4		
5	i. Internet Technologies ii. Statistical Computing and RProgramming iii. Software Engineering iv. LAB: R Programming v. LAB: JAVA Script, HTML and CSS vi. Vocational 1	3 3 3 3	 4 4 	(a) Cyber Law and CyberSecurity (b) Cloud Computing (c) Business Intelligence	3 3 3
6	i. Artificial Intelligence and Applications ii. PHP and MySQL iii. LAB: PHP and MySQL iv. PROJECT: v. Vocational 2	3 3 3	 4 12 	(a) Fundamentals of DataScience (b) Mobile Application Development (c) Embedded Systems	3 3 3
7	i. Analysis and Design of Algorithms ii. Data Mining and KnowledgeManagement iii. LAB: Algorithms iv. LAB: Data Mining and KnowledgeManagement v. Vocational 3	3 3	 4 4 	(a) Data Compression (b) IoT (c) Data Analytics	3 3 3
8	i. Automata Theory and CompilerDesign ii. Cryptography and Network Security iii. Compiler Lab iv. LAB: Project v. Vocational 4	3 3 3	 4 12 	(a) Open-Source Programming (b) Storage Area Networks (c) Pattern Recognition (a) Machine Learning	3 3 3 3

TABLE I: COURSE STRUCTURE FOR BCA.

Semester	Course Code	Title of the Paper	Credit	Total Credit of OE, Languages, CAE, Voc, AECC, SEC	Total Credit
I	CAC01	Fundamentals of Computers	3	13	26
	CAC02	Programming in C	3		
	CAC03(a)/(b)	Mathematical Foundation	3		
	CAC01P	LAB: Information Technology	2		
	CAC02P	LAB: C Programming	2		
II	CAC04	Data Structures using C	3	13	26
	CAC05	Object Oriented Concepts using JAVA	3		
	CAC06	Discrete Mathematical Structures	3		
	CAC04 P	LAB: Data Structure	2		
	CAC05 P	LAB: JAVA	2		
III	CAC07	Data Base Management Systems	3	13	26
	CAC08	C# and DOT NET Framework	3		
	CAC09	Computer Communication and Networks	3		
	CAC07P	LAB: DBMS	2		
	CAC08P	LAB: C# and DOT NET Framework	2		
IV	CAC10	Python Programming	3	13	26
	CAC11	Computer Multimedia and Animation	3		
	CAC12	Operating System Concepts	3		
	CAC10P	LAB: Python programming	2		
	CAC11P	LAB: Multimedia and Animation	2		
V	CAC13	Internet Technologies	3	10	23
	CAC14	Statistical Computing and R Programming	3		
	CAC15	Software Engineering	3		
	CAC13P	LAB: JAVA Script, HTML and CSS	2		
	CAC14P	LAB: R Programming	2		
VI	CAC16	PHP and MySQL	3	10	23
	CAC17	Artificial Intelligence and Applications	3		
	CAC16P	LAB: PHP and MySQL	2		
	CA-P1	Project Work	5		
VII	CAC18	Analysis and Design of Algorithms	3	11	21
	CAC19	Data Mining and Knowledge Management	3		
	CAC18P	LAB: Algorithms	2		
	CAC19P	LAB: Data Mining	2		
	CAI01	Internship	2		
VIII	CAC20	Automata Theory and Compiler Design	3	6	20
	CAC21	Cryptography and Network Security	3		
	CAC20P	LAB: Compiler Lab	2		
	CAP02	Project Work	6		

TABLE II: CS COURSE DETAILS FOR BCA

Course-Type	Course Code as referred above	Compulsory/ Elective	List of compulsory courses and list of option of elective courses. (A suggestive list)
CA	CAC01, CAC02, CAC03(a)/(b), CAC04, CAC05, CAC06, CAC07, CAC08, CAC09, CAC10, CAC11, CAC12, CAC13, CAC14, CAC15, CAC16, CAC17, CAC18, CAC19, CAC20, CAC21	Compulsory	As Mentioned in Table I
CA E	CAE-1A	Elective	Cyber Law and Cyber Security OR Business Intelligence OR Fundamentals of Data Science
	CAE-2A	Elective	Fundamentals of Data Science OR Mobile Application Development OR Embedded Systems
	CAE-3A	Elective	Data Compression OR Internet of Things (IoT) OR Data Analytics
	CAE-4A	Elective	Open-source Programming OR Storage Area Networks OR Pattern Recognition OR Machine Learning
Vocational	Vocational -1	Elective	DTP, CAD and Multimedia OR Hardware and Server Maintenance OR Web Content Management Systems OR Computer Networking OR Health Care Technologies OR Digital Marketing OR Office Automation
	Vocational -2	Elective	
	Vocational -3	Elective	
	Vocational -4	Elective	
SEC	SEC 1	Compulsory	Health & Wellness/ Social & Emotional Learning
	SEC 2	Compulsory	Sports/NCC/NSS etc
	SEC 3	Compulsory	Ethics & Self Awareness
	SEC 4	Compulsory	Professional Communication
AECC	AECC1	Compulsory	Environmental Studies
	AECC2	Compulsory	Constitution of India
Language 1	L1-1, L1-2, L1-3, L1-4	Compulsory	Kannada/Functional Kannada
Language 2	L2-1, L2-2, L2-3, L4-4	Elective	English/Hindi/French/ Additional English/ etc.

Computer Application Core Courses (CA C) for BCA (Hons)

Sl. No	Course Code	Title of the Paper
1	CAC01	Fundamentals of Computers
2	CAC02	Programming in C
3	CAC03 (a)/(b)	Mathematical Foundation/ Accountancy
4	CAC04	Discrete Mathematical Structures
5	CAC05	Object Oriented Concepts using JAVA
6	CAC06	Data Structures using C
7	CAC07	Data Base Management Systems
8	CAC08	C# and DOT NET Framework
9	CAC09	Computer Communication and Networks
10	CAC10	Python Programming
11	CAC11	Computer Multimedia and Animation
12	CAC12	Operating System Concepts
13	CAC13	Internet Technologies
14	CAC14	Statistical Computing and R Programming
15	CAC15	Software Engineering
16	CAC16	PHP and MySQL
17	CAC17	Artificial Intelligence and Applications
18	CAC18	Analysis and Design of Algorithms
19	CAC19	Data Mining and Knowledge Management
20	CAC20	Automata Theory and Compiler Design
21	CAC21	Cryptography and Network Security

Computer Application Electives (CA E) for BCA (Hons)

Sl. No	Computer Application Electives (CA E)
1	Business Intelligence
02	Cyber Law and Cyber Security
3	Data Analytics
4	Data Compression
5	Embedded Systems
6	Fundamentals of Data Science
7	Internet of Things (IoT)
8	Machine Learning
9	Mobile Application Development
10	Open-source Programming
11	Pattern Recognition
12	Storage Area Networks

Vocational Electives

Sl. No	Vocational Electives
1	DTP, CAD and Multimedia
2	Hardware and Server Maintenance
3	Web Content Management Systems
4	Computer Networking
5	Health Care Technologies
6	Digital Marketing
7	Office Automation

Open Electives in Computer Applications:

- Office Automation
- Computer Fundamentals
- Problem Solving and C Programming Concepts
- Python Programming Concepts
- Web Designing
- Accounting Package
- E-Commerce
- Multimedia Processing
- R Programming
- E-Content Development
- Computer Animation

Syllabus for BCA (Basic and Honors) 1st and 2nd Semesters

Semester: I

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

Course Outcomes (COs):

- Introduction to computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers
- Operating systems, functions of operating systems, classification of operating systems, kernel, shell, basics of Unix, shell programming, booting
- Databases, why databases are used, users, SQL, data types in SQL, introduction of queries - select, alter, update, delete, truncate, using where, and or in not in
- Internet basics, features, applications, services, internet service providers, domain name system, browsing, email, searching
- Web Programming basics, introduction of HTML and CSS programming
- Introduction of computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers.

Course Content

Content	Hours
Unit - 1	
Fundamentals of Computers: Introduction to Computers - Computer Definition, Evolution and History of Computers, Basic Organisation of a Digital Computer; Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples (at least 5 hours of teaching).	10

Unit-2

Introduction to Computer: Characteristics of computers, Classification of Digital Computer Systems: Microcomputers, Minicomputers, Mainframes, Super computers. Anatomy of Computer: Introduction, Functions & Components of a Computer, Central Processing Unit, Storage units, Input and output Devices. How CPU and memory works. Program execution with illustrative examples. Introduction to microcontrollers.	10
Unit-3	
Operating System Fundamentals: Operating Systems: Introduction, Functions of an operating System, Classification of Operating Systems, System programs, Application programs, Utilities, The Unix Operating System, Basic Unix commands, Microkernel Based Operating System, Booting.	08
Unit-4	
Introduction to Database Management Systems: Database, DBMS, Why Database -File system vs DBMS, Database applications, Database users, Introduction to SQL, Data types, Classification of SQL-DDL with constraints, DML, DCL, TCL	08
Unit-5	
Internet Basics: Introduction, Features of Internet, Internet application, Services of Internet, Logical and physical addresses, Internet Service Providers, Domain Name System. **Web Basics:** Introduction to web, web browsers, http/https, URL, HTML5, CSS	06

Text 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,

Reference:

1. J. Glenn Brook shear," Computer Science: An Overview", Addision-Wesley, Twelfth Edition,
2. R.G. Dromey, "How to solve it by Computer", PHI,

Course Code: CAC01P	**Course Title: Information Technology Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 04

Part A:

1. Activities using Word Processor Software
2. Activities using Spreadsheets Software
3. Activities using Presentation Software
4. Activities involving Multimedia Editing (Images, Video, Audio …)
5. Tasks involving Internet Browsing

Part B:

1. Flow charts: Installation and using of flowgarithms software for different arithmetic tasks like sum, average, product, difference, quotient and remainder of given numbers, calculate area of Shapes (Square, Rectangle, Circle and Triangle),decision making and looping, arrays and recursion(at least 10 problems covering all concepts).

   NOTE: In addition to the ones listed above, universities can include other activities so as for the student to become proficient in using personal computers for multiple purposes for which modern computers can be put to use.

Reference:

1. Computational Thinking for the Modern Problem Solver, By Riley DD, Hunt K.A CRC press, 2014
2. Ferragina P, Luccio F. Computational Thinking: First Algorithms, Then Code. Springer

Web References:

http://www.flowgorithm.org/documentation/

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Activity – 1 from Part A	Write up on the activity/ task	5
	Demonstration of the activity/ task	10
Activity-2 from Part B	Write up on the activity/ task	5
	Demonstration of the activity/ task	10
Viva Voce based on Lab Activities		05
Practical Records		05
Total		**40**

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

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

Course Content

Content	Hours
Unit - 1	
Introduction to C Programming: Overview of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C. **C Programming Basic Concepts:** C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants.	5
Unit-2	
Input and output with C: Formatted I/O functions - *printf* and *scanf,* control stings and escape sequences, output specifications with *printf* functions; Unformatted I/O functions to read and display single character and a string - *getchar, putchar, gets* and *puts* functions.	4
Unit-3	
C Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associatively; Evaluation of arithmetic expressions; Type conversion.	11

Control Structures: Decision making Statements - S*imple if, if_else*, *nested if_else, else_if ladder, Switch Case*, *goto, break* & *continue* statements; Looping Statements - Entry controlled and exit controlled statements, *while, do-while, for* loops, Nested loops.	
Unit - 4	
Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation. **Pointers in C:** Understanding pointers - Declaring and initializing pointers, accessing address and value of variables using pointers; Pointers and Arrays; Pointer Arithmetic; Advantages and disadvantages of using pointers;	12
Unit-5	
User Defined Functions: Need for user defined functions; Format of C user defined functions; Components of user defined functions - return type, name, parameter list, function body, return statement and function call; Categories of user defined functions - With and without parameters and return type. **User defined data types**: Structures - Structure Definition, Advantages of Structure, declaring structure variables, accessing structure members, Structure members initialization, comparing structure variables, Array of Structures; Unions - Union definition; difference between Structures and Unions.	10

Text Books:

1. C: The Complete Reference, By Herbert Schildt.
2. M.T Somashekara, D.S Guru and K.S. Manjunatha: Problem solving with C, PHI publication
3. C Programming Language, By Brain W. Kernighan
4. Kernighan & Ritchie: The C Programming Language (PHI)

Reference Books:

1. P. K. Sinha & Priti Sinha: Computer Fundamentals (BPB)
2. E. Balaguruswamy: Programming in ANSI C (TMH)
3. Kamthane: Programming with ANSI and TURBO C (Pearson Education)
4. V. Rajaraman: Programming in C (PHI – EEE)
5. S. Byron Gottfried: Programming with C (TMH)
6. Yashwant Kanitkar: Let us C
7. P.B. Kottur: Programming in C (Sapna Book House).

Course Code: CAC02P	**Course Title: C Programming Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks:10
Exam Marks: 40	Exam Duration: 04

Programming Lab**Part A:**

1. Write a C Program to read radius and find area and volume of a sphere.
2. Write a C Program to read three numbers and find the biggest of three
3. Write a C Program to demonstrate library functions in *math.h* (at least 5)
4. Write a C Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
5. Write a C Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers
6. Write a C Program to read percentage of marks and to display appropriate grade (using switch case)
7. Write a C Program to find the roots of quadratic equation (if else ladder)
8. Write a C program to read marks scored in 3 subjects by n students and find the average of marks and result (Demonstration of single dimensional array)
9. Write a C Program to remove Duplicate Element in a single dimensional Array
10. Program to perform addition and subtraction of Matrices

Part B:

1. Write a C Program to find the length of a string without using built in function
2. Write a C Program to demonstrate string functions (at least 3).
3. Write a C Program to demonstrate pointers in C
4. Write a C Program to generate n prime number by defining *isprime ()* function
5. Write a C Program to find the trace of a square matrix using function
6. Write a C Program to read, display and multiply two matrices using functions
7. Write a C Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.
8. Write a C Program to Reverse a String using Pointer
9. Write a C Program to demonstrate student structure to read & display records of n students.
10. Write a C Program to demonstrate the difference between structure & union.

Note: Student has to execute a minimum of 8 programs in each part to complete the Lab course

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part B	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	08
Viva Voce based on C Programming		05
Practical Record		05
Total		**40**

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

Course Outcomes (COs):

- Study and solve problems related to connectives, predicates and quantifiers under different situations.
- Develop basic knowledge of matrices and to solve equations using Cramer's rule.
- Know the concept of Eigen values.
- To develop the knowledge about derivatives and know various applications of differentiation.
- Understand the basic concepts of Mathematical reasoning, set and functions

Content	Hours
Unit - 1	
Mathematical logic: 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.	10
Unit - 2	
sets and Functions: power set- Venn diagram Cartesian product-relations - functions- types of functions - composition of functions.	10
Unit - 3	
Matrices and determinant: Introduction-Types of matrices-matrix operations-transpose of a matrix -determinant of matrix - inverse of a matrix-Cramer's rule	10
Unit – 4	
Matrix algebra: finding rank of a matrix – normal form-echelon form Cayley Hamilton theorem-Eigen values.	06
Unit -5	
Differential calculus: Functions and limits - Simple Differentiation of Algebraic Functions – Evaluation of First and Second Order Derivatives – Maxima and Minima	06

Text Books:

P. R. Vittal-Business Mathematics and Statistics, Margham Publications, Chennai,

Reference Books:

B. S. Vatsa-Discrete Mathematics –New Age International Limited Publishers, NewDelhi

Semester: II

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

Course Outcomes (COs):

After completing this course satisfactorily, a 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, records, 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

Course Content

Content	Hours
Unit - 1	
Introduction to data structures: Definition; Types of data structures - Primitive & Non-primitive, Linear and Non-linear; Operations on data structures. Algorithm Specification, Performance Analysis, Performance Measurement Recursion: Definition; Types of recursions; Recursion Examples - Fibonacci numbers, GCD, Binomial coefficient nCr, Towers of Hanoi; Comparison between iterative and recursive functions.	08
Unit - 2	
Arrays: Basic Concepts – Definition, Declaration, Initialization, Operations on arrays; Types of arrays; Arrays as abstract data types (ADT); Representation of Linear Arrays in memory; Traversing linear arrays; Inserting and deleting elements; Sorting – Selection sort, Bubble sort, Quick sort, Insertion sort, merge sort; Searching - Sequential Search, Binary search; Iterative and Recursive searching; Multidimensional arrays; Representation of multidimensional arrays; Sparse matrices.	12
Unit - 3	

Stacks: Basic Concepts – Definition and Representation of stacks; Operations on stacks; Applications of stacks; Infix, postfix and prefix notations; Conversion from infix to postfix using stack; Evaluation of postfix expression using stack; Application of stack in function calls. Queues: Basic Concepts – Definition and Representation of queues; Types of queues – Simple queues, Circular queues, Double ended queues, Priority queues; Operations on Simple queues;	10
Unit-4	
Dynamic memory allocation: Static & Dynamic memory allocation; Memory allocation and de- allocation functions - malloc, calloc, realloc and free. Linked list: Basic Concepts – Definition and Representation of linked list, Types of linked lists - Singly linked list, Doubly liked list, Header liked list, Circular linked list; Representation of Linked list in Memory; Operations on Singly linked lists – Traversing, Searching, Insertion, Deletion; Memory allocation; Garbage collection.	12
Unit-5	
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; Binary tree: Type of binary trees - strict binary tree, complete binary tree, binary search tree and heap tree; Array representation of binary tree. Traversal of binary tree; preorder, inorder and postorder traversal; Reconstruction of a binary tree when any two of the traversals are given.	10

Text Books

1. Ellis Horowitz and Sartaj Sahni: Fundamentals of Data Structures

References

1. Tanenbaum: Data structures using C (Pearson Education)
2. Kamathane: Introduction to Data structures (Pearson Education)
3. Y. Kanitkar: Data Structures Using C (BPB)
4. Kottur: Data Structure Using C
5. Padma Reddy: Data Structure Using C
6. Sudipa Mukherjee: Data Structures using C – 1000 Problems and Solutions (McGraw Hill Education, 2007))

Course Code: CAC04P	**Course Title: Data Structures Lab**
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 03 Hours

Programming Lab

Part A:

1. Write a C Program to find GCD using recursive function
2. Write a C Program to display Pascal Triangle using binomial function
3. Write a C Program to generate n Fibonacci numbers using recursive function.
4. Write a C Program to implement Towers of Hanoi.
5. Write a C Program to implement dynamic array, find smallest and largest element of the array.
6. Write a C Program to read the names of cities and arrange them alphabetically using bubble sort.
7. Write a C Program to sort the given list using selection sort technique.
8. Write a C Program to sort the given list using insertion sort technique.

Part B:

1. Write a C Program to sort the given list using quick sort technique.
2. Write a C Program to sort the given list using merge sort technique.
3. Write a C Program to search an element using linear search technique and recursive binary search technique.
4. Write a C Program to implement Stack.
5. Write a C Program to convert an infix expression to postfix.
6. Write a C Program to implement simple queue.
7. Write a C Program to implement linear linked list.
8. Write a C Program to implement traversal of a binary tree.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A	Algorithm	02
	Writing the Program	05
	Execution and Formatting	05
Program -2 from Part B	Algorithm	04
	Writing the Program	06
	Execution and Formatting	08
Viva Voce based on Data structures		05
Practical Record		05
Total		**40**

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

Course Outcomes (COs):

After completing this course satisfactorily, a 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

Course Content

Content	Hours
Unit - 1	
Introduction to OOPS and Java: OOPS concepts and paradigm, Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, method Overloading, Math class, Arrays in java.	08
Unit - 2	
Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference, I/O streams.	10
Unit-3	
Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.	08
Unit-4	

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.	6
Unit - 5	
Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing.	10

Text Books

1. Programming with Java, By E Balagurusamy – A Primer, Fourth Edition, Tata McGraw Hill Education Private Limited.
2. Core Java Volume I – Fundamentals, By Cay S. Horstmann, Prentice Hall
3. Object Oriented Programming with Java : Somashekara, M.T., Guru, D.S., Manjunatha, K.S

Reference Books:

1. Java 2 - The Complete Reference – McGraw Hill publication.
2. Java - The Complete Reference, 7th Edition, By Herbert Schildt– McGraw Hill publication.

Course Code: CAC05P	**Course Title:** JAVA Lab
Course Credits: 02	Hours/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 10
Exam Marks: 40	Exam Duration: 04 Hours

Course Outcomes (COs):

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

- Implement Object Oriented programming concept using basic syntaxes of control Structures
- Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
- Demonstrates how to achieve reusability using inheritance
- Demonstrate understanding and use of interfaces, packages, different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
- Identify and describe common user interface components to design GUI in Java using Applet & AWT along with response to events

Practice Lab

1. Program to print the following triangle of numbers
   1
   1 2
   1 2 3
   1 2 3 4
   1 2 3 4 5
2. Program to simple java application, to print the message, "Welcome to java"
3. Program to display the month of a year. Months of the year should be held in an array.
4. Program to find the area of rectangle.
5. program to demonstrate a division by zero exception
6. Program to create a user defined exception say Pay Out of Bounds.

Programming Lab

PART A: Java Fundamentals OOPs in Java

1. Program to add two integers and two float numbers. When no arguments are supplied, give a default value to calculate the sum. Use function overloading.

2. Program to perform mathematical operations. Create a class called AddSub with methods to add and subtract. Create another class called MulDiv that extends from AddSub class to use the member data of the super class. MulDiv should have methods to multiply and divide A main function should access the methods and perform the mathematical operations.
3. Program with class variable that is available for all instances of a class. Use static variable declaration. Observe the changes that occur in the object's member variable values.
4. Program to create a student class with following attributes;
   Enrollment No: Name, Mark of sub1, Mark of sub2, mark of sub3, TotalMarks. Total of the three marks must be calculated only when the student passes in all three subjects. The pass mark for each subject is 50. If a candidate fails in any one of the subjects his total mark must be declared as zero. Using this condition write a constructor for this class. Write separate functions for accepting and displaying student details. In the main method create an array of n student objects and display the details.
5. In a college first year class are having the following attributes Name of the class (BCA, BCom, BSc), Name of the staff No of the students in the class, Array of students in the class. Define a class called first year with above attributes and define a suitable constructor. Also write a method called best Student () which process a first-year object and return the student with the highest total mark. In the main method define a first-year object and find the best student of this class
6. Program to define a class called employee with the name and date of appointment. Create ten employee objects as an array and sort them as per their date of appointment. ie, print them as per their seniority.

PART B: Exception Handling & GUI Programming

1. Program to catch Negative Array Size Exception. This exception is caused when the array is initialized to negative values.
2. Program which create and displays a message on the window
3. Program to draw several shapes in the created window
4. Program which creates a frame with two buttons father and mother. When we click the father button the name of the father, his age and designation must appear. When we click mother similar details of mother also appear.
5. Program to move any one shape according to the arrow key pressed.
6. Program to create a window when we press M or m the window displays Good Morning, A or a the window displays Good After Noon E or e the window displays Good Evening, N or n the window displays Good Night
7. Demonstrate the various mouse handling events using suitable example.
8. Program to create menu bar and pull-down menus.

Evaluation Scheme for Lab Examination

Assessment Criteria		Marks
Program – 1 from Part A		
	Writing the Program	07
	Execution and Formatting	08
Program -2 from Part B		
	Writing the Program	07
	Execution and Formatting	08
Viva Voce based on C Programming		05
Practical Record		05
Total		**40**

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

Course Outcomes (COs):

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

- To understand the basic concepts of Mathematical reasoning, set and functions.
- To understand various counting techniques and principle of inclusion and exclusions.
- Understand the concepts of various types of relations, partial ordering and
- equivalence relations.
- Apply the concepts of generating functions to solve the recurrence relations.
- Familiarize the fundamental concepts of graph theory and shortest path algorithm

Course Content

Content	Hours
Unit - 1	
The Foundations: Logic and proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy. **Basic Structures**: Sets, Functions, Sequences, Sums, and Matrices: Sets, set operations, Functions, Sequences and Summations, matrices.	12
Unit - 2	
Counting: Basics of counting, Pigeonhole principle, Permutation and combination, Binomial Coefficient and Combination, Generating Permutationand Combination**.** **Advanced Counting Techniques**: Applications of Recurrence Relations, Solving Linear Recurrence, Relations, Divide and Conquer Algorithms and Recurrence Relations, Generating functions, Inclusion-Exclusion, Applications ofInclusion-exclusion	10

Unit - 3	
Induction and Recursion: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, **Relation:** Properties of relation, Composition of relation, Closer operation on relation, Equivalence relation and partition. Operation on relation, Representing relation.	12
Unit-4	
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.	08

Text Book:

1. Discrete Mathematics and Its Applications, Kenneth H. Rosen: Seventh Edition, 2012.

References:

2. Discrete Mathematical Structure, Bernard Kolman, Robert C, Busby, Sharon Ross, 2003.
3. Graph Theory with Applications to Engg and Comp. Sci: Narsingh Deo-PHI 1986.
4. Discrete and Combinatorial Mathematics Ralph P. Grimaldi, B. V. Ramatta, Pearson, Education, 5 Edition.
5. Discrete Mathematical Structures, Trembley and Manohar.

Note: The syllabi of the courses of remaining semesters shall be framed in subsequent BoS meetings.

Syllabus for Open Electives in Computer Applications:

Course Code: CAOE01	**Course Title: Computer Fundamentals**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

- Introduction to computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers
- Operating systems, functions of operating systems, classification of operating systems, kernel, shell, basics of Unix, shell programming, booting
- Databases, why databases are used, users, SQL, data types in SQL, introduction of queries - select, alter, update, delete, truncate, using where, and or in not in
- Internet basics, features, applications, services, internet service providers, domain name system, browsing, email, searching
- Web Programming basics, introduction of HTML and CSS programming
- Introduction of computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers.

-

Course Content

Content	Hours
Unit - 1	
Fundamentals of Computers: Introduction to Computers - Computer Definition, Evolution and History of Computers, Basic Organisation of a Digital Computer; Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples(at least 5 hours of teaching .	10
Unit-2	

Introduction to Computer: Characteristics of computers, Classification of Digital Computer Systems: Microcomputers, Minicomputers, Mainframes, Super computers. Anatomy of Computer: Introduction, Functions & Components of a Computer, Central Processing Unit, Storage units, Input and output Devices. How CPU and memory works. Program execution with illustrative examples. Introduction to microcontrollers.	10
Unit-3	
Operating System Fundamentals: Operating Systems: Introduction, Functions of an operating System, Classification of Operating Systems, System programs, Application programs, Utilities, The Unix Operating System, Basic Unix commands, Microkernel Based Operating System, Booting.	08
Unit-4	
Introduction to Database Management Systems: Database, DBMS, Why Database -File system vs DBMS, Database applications, Database users, Introduction to SQL, Data types, Classification of SQL-DDL with constraints, DML, DCL, TCL	08
Unit-5	
Internet Basics: Introduction, Features of Internet, Internet application, Services of Internet, Logical and physical addresses, Internet Service Providers, Domain Name System. **Web Basics:** Introduction to web, web browsers, http/https, URL, HTML5, CSS	06

Text Books:

3. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication
4. David Riley and Kenny Hunt, Computational thinking for modern solver, Chapman & Hall/CRC,

Reference:

3. J. Glenn Brook shear," Computer Science: An Overview", Addision-Wesley, Twelfth Edition,
4. R.G. Dromey, "How to solve it by Computer", PHI,

Course Code: CAOE02	**Course Title: Problem Solving and C Programming Concepts**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Outcomes (COs):

- Introduction to computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers
- Operating systems, functions of operating systems, classification of operating systems, kernel, shell, basics of Unix, shell programming, booting
- Databases, why databases are used, users, SQL, data types in SQL, introduction of queries - select, alter, update, delete, truncate, using where, and or in not in
- Internet basics, features, applications, services, internet service providers, domain name system, browsing, email, searching
- Web Programming basics, introduction of HTML and CSS programming
- Introduction of computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers.

Course Content

Content	**Hours**
Unit – 1	
Problem Solving Techniques: Problem solving techniques – problem definition, analysis, design, debugging, testing, documentation and maintenance. Design Tools -ALGORITHM: definition, characteristics, advantages and disadvantages. FLOWCHART - definition, symbols, advantages and disadvantages. Writing an algorithm and flowchart: Area of circle, arithmetical operations, simple interest and compound interest, quadratic equation, largest of three numbers, sum of N natural numbers, factorial of number, Fibonacci series, prime number, reverse a given number, evaluation of series like sin(x), cos(x), ex, log(x) etc.	10
Unit-2	
Introduction to C Programming: Overview of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C. **C Programming Basic Concepts:** C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants, Formatted I/O functions - *printf* and *scanf,*	10

Unit-3	
C Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associatively; Evaluation of arithmetic expressions; Type conversion.	08
Unit-4	
Decision making, branching and looping: Decision making - if and if-else statement, nested if, else if ladder, switch statements, conditional operator, goto statement. Looping - while, do-while and for, nested for. break and continue statements. Programs on these concepts.	08
Unit-5	
Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays -Declaration, Initialization and Memory representation.	06

References :

1. Computer Concepts and Programming, Padma Reddy
2. Let us C , Yashwanth Kanetkar
3. Ansi C, Balagurusamy
4. Problem solving with C, M. T. Somashekara and D. S. Guru

Course Code: CAOE03	**Course Title: Office Automation**
Course Credits: 03	Hours/Week: 03
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 03 Hours

Course Content

Content	**Hours**
Unit – 1	
Windows Desk top - GUI: Definition, Standards, Cursors/Pointers, Icons, GUI Menus, GUI-Share Data – Desktop icons and their functions: My computer, My documents, Network neighbourhood, Recycle Bin, Quick launch tool bar, System tray, Start menu, Task bar – Dialog Boxes: List Box, Spin Control Box, Slide, Drop-down list, Radio button, Check box, Text box, Task Bar - System Tray - Quick launch tool bar - Start button - Parts of Windows -Title bar-Menu bar - Scroll bar- Status bar, Maximize, Minimize, close and Resize & Moving a Window – Windows - Start Menu –Help Menu- Preview Menu; Logoff & Shutdown – Keyboard Accelerators: Key board short keys or hotkeys	06
Unit-2	
MS Word - Working with Documents -Opening & Saving files, Editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Formatting page & setting Margins, Converting files to different formats, Importing & Exporting documents, Sending files to others, Using Tool bars, Ruler, Using Icons, using help, Formatting Documents - Setting Font styles, Font selection- style, size, colour etc, Type face - Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering. Setting Page style - Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes – Shortcut Keys; Inserting manual page break, Column break and line break, creating sections & frames, Anchoring & Wrapping, Setting Document styles, Table of Contents, Index, Page Numbering, date & Time, Author etc., Creating Master Documents, Web page. Creating Tables- Table settings,	10

Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula, Drawing - Inserting ClipArt, Pictures/Files etc., Tools – Word Completion, Spell Checks, Mail merge, Templates, Printing Documents – Shortcut keys.	
Unit-3	
MS Excel: Spread Sheet & its Applications, Opening Spreadsheet, Menus - main menu, Formula Editing, Formatting, Toolbars, Using Icons, Using help, Shortcuts, Spreadsheet types. Working with Spreadsheets- opening, saving files, setting Margins, Converting files to different formats (importing, exporting, sending files to others), Spread sheet addressing - Rows, Columns & Cells, Referring Cells & Selecting Cells – Shortcut Keys. Entering & Deleting Data- Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, highlighting values, Find, Search & replace, Inserting Data, Insert Cells, Column, rows & sheets, Symbols, Data from external files, Frames, Clipart, Pictures, Files etc., Inserting Functions, Manual breaks, Setting Formula - finding total in a column or row, Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formulae. Formatting Spreadsheets, Formatting layout for Graphics, Clipart etc., Worksheet Row & Column Headers, Sheet Name, Row height & Column width, Visibility - Row, Column, Sheet, Security, Sheet Formatting & style, Sheet background, Colour etc, Borders & Shading – Shortcut keys. Working with sheets – Sorting, Filtering, Validation, Consolidation, and Subtotal. Creating Charts - Drawing. Printing. Using Tools	10
Unit-4	
MS Power point: Introduction to presentation – Opening new presentation, Different presentation templates, setting backgrounds, Selecting presentation layouts. Creating a presentation - Setting Presentation style, Adding text to the Presentation. Formatting a Presentation - Adding style, Colour, gradient fills, arranging objects, Adding Header & Footer, Slide Background, Slide layout. Adding Graphics to the Presentation- Inserting pictures, movies, tables etc into presentation, Drawing Pictures using Draw. Adding Effects to the Presentation- Setting Animation & transition effect. Printing Handouts, Generating Standalone Presentation viewer.	10
Unit-5	

Internet and Web Browsers: Definition of WebAddressing-URL-Different types of Internet Connections; Dial up connection, Broad band (ISDN, DSL, Cable), Wireless (Wi-Fi, WiMax, Satellite, Mobile) naming convention, browsers and its types, internet browsing, searching - Search Engines - Portals - Social Networking sites- Blogs - viewing a webpage, downloading and uploading the website; Creating an email-ID, e-mail reading, saving, printing, forwarding and deleting the mails, checking the mails, viewing and running file attachments, addressing with cc and bcc.	06

References:

1. Fundamentals of computers - V.Rajaraman - Prentice- Hall of india
2. Microsoft Office 2007 Bible - John Walkenbach,Herb Tyson,Faithe Wempen,cary N.Prague,Michael R.groh,Peter G.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd.
3. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications.
4. Computer & Internet Basics Step-by-Step - Etc-end the Clutter - Infinity Publishing.
5. https://en.wikipedia.org
6. http://windows.microsoft.com/en-in/windows/windows-basics-all-topics

KUVEMPU UNIVERSITY

Syllabus for Bachelor of Computer Applications

(B.C.A – V & VI Semester)

NEP-2020

Under Graduate Board of Studies

In

COMPUTER SCIENCE

w.e.f Academic Year 2023-24 onwards

Curriculum Design / Syllabus Framing Committee

Sl. No.	Name	Designation
1.	**Dr. Suresha M** Associate Professor, Department of P.G Studies and Research in Computer Science, Kuvempu University, Shankaraghatta – 577541, Shimoga(D).	**Chairman**
2.	**Dr. Shoieb Ahamed** Assistant Professor, Department of Computer Science, Government First Grade College, Sorab – 577429, Shimoga(D).	**Member**
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4.	**Mr. Gopala B** Assistant Professor, Department of Computer Science, Government First Grade College Shikaripura-577427, Shimoga(D).	**Member**
5.	**Mr. Krishnamurthy K** Assistant Professor, Department of Computer Science, Government First Grade College, Thirthahalli -577432, Shimoga(D).	**Member**
6.	**Mr. Prajwal Kumar P** Assistant Professor, Department of Computer Science, Government First Grade College, Kadur – 577548.	**Member**

Program: B.C.A **Subject: Computer Science**

Curriculum Structure for B.C.A

Semester	Course No.	Theory/ Practical	Credits	Teaching Hours per week (L+T+P)	Paper Title	Marks	
						S.A.	I.A.
V	DSC13	Theory	4	4+0+0	Design & Analysis of Algorithms	60	40
	DSC13-Lab	Practical	2	0+0+4	Design & Analysis of Algorithms Lab	25	25
	DSC14	Theory	4	4+0+0	Statistical Computing and R Programming	60	40
	DSC14-Lab	Practical	2	0+0+4	R Programming Lab	25	25
	DSC15	Theory	4	4+0+0	Software Engineering	60	40
	DSE-E1	Theory	3	3+0+0	A. Cloud Computing B. Business Intelligence	60	40
	Voc-1	Theory	3	3+0+0	Digital Marketing	60	40
	SEC-4	Theory& Practical	2	2+0+1	Cyber Security	60	40
VI	DSC16	Theory	4	4+0+0	Artificial Intelligence and Applications	60	40
	DSC17	Theory	4	4+0+0	PHP and MySQL	60	40
	DSC17-Lab	Practical	2	0+0+4	PHP and MySQL Lab	25	25
	DSC18	Theory	4	4+0+0	Data Mining and Data Warehouse	60	40
	DSE-E2	Theory	3	3+0+0	**A.** Digital Image Processing **B.** Mobile Application Development	60	40
	Voc-2	Theory	3	3+0+0	Web Content Management System	60	40
	SEC-5	Practical	2	0+0+3	Internship/ Mini Project	60	40

Program Name	**B.C.A**	Semester	**V**
Course Title	**Design and Analysis of Algorithm (Theory)**		
Course Code	**DSC 13**	No. of Credits	**04**
Contact hours	**52 Hours/4 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**52 Hrs**
Introduction: What is an Algorithm? Fundamentals of Algorithmic problem solving, Fundamentals of the Analysis of Algorithm Efficiency, Analysis Framework, Measuring the input size, Units for measuring Running time, Orders of Growth, Worst-case, Best- Case and Average-case efficiencies.	**10**
Asymptotic Notations and Basic Efficiency classes, Informal Introduction, O-notation, Ω-notation, θ-notation, mathematical analysis of non-recursive algorithms, mathematical analysis of recursive algorithms.	**10**
Brute Force & Exhaustive Search: Introduction to Brute Force approach, Selection Sort and Bubble Sort, Sequential search, Exhaustive Search- Travelling Salesman Problem and Knapsack Problem, Depth First Search, Breadth First Search	**14**
Divide-and-Conquer: Introduction, Merge Sort, Quick Sort, Binary Search, Binary Tree traversals and related properties.	**8**
Decrease-and-Conquer: Introduction, Insertion Sort, Topological Sorting**.** **Greedy Technique:** Introduction, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm.	**10**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

Program Name	**B.C.A**	Semester	**V**
Course Title	**Design and Analysis of Algorithms Laboratory (Practical)**	No. of Credits	**02**
Course Code	**DSC 13 - Lab**	Contact Hours	**4 Hours/wk**
Formative Assessment	**25 Marks**	Summative Assessment	**25 Marks**

Practical Content

1. Write a program to sort a list of N elements using Selection Sort Technique.
2. Write a program to perform Travelling Salesman Problem.
3. Write a program to perform Knapsack Problem using Greedy Solution.
4. Write program to implement the DFS and BFS algorithm for a graph.
5. Write a program to find minimum and maximum value in an array using divide and conquer.
6. Write a test program to implement Divide and Conquer Strategy. Eg: Quick sort algorithm for sorting list of integers in ascending order.
7. Write a program to implement Merge sort algorithm for sorting a list of integers in ascending order.
8. Implement function to print In-Degree, Out-Degree and to display that adjacency matrix.
9. Write program to implement Greedy Algorithm for job sequencing with deadlines.
10. Write program to implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.
11. Write a program that implements Prim's algorithm to generate minimum costs panning Tree.
12. Write a program that implements Kruskal's algorithm to generate minimum costs panning Tree.

Formative Assessment for Practical	
Assessment Occasion/type	**Marks**
Program Writing Any One Program	10 Marks
Execution	10 Marks
viva	05 Marks
Total	**25 Marks**

References

1	Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009, Pearson.
2	Computer Algorithms/C++, Ellis Horowitz, Satraj Sahniand Rajasekaran, 2nd Edition, 2014, Universities Press.
3	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
4	Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)

Program Name	**B.C.A**	Semester	**V**
Course Title	**Statistical Computing & R Programming (Theory)**		
Course Code	**DSC14**	No. of Credits	**04**
Contact hours	**52 Hours/4 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**52 Hrs**
Introduction of R programming language: Introduction, Features of R, Data types in R: numeric, arithmetic, assignment, Operators, Data Objects in R :Arrays, Lists,vectors, Matrices and Data Frames, Factors Conditions and Loops: if, Switch, while, for ,repeatloops, Strings handling in R, Calling Functions, Writing Functions,Exceptions, Date&Timings and Visibility, Packaging in R.	**12**
Reading and writing files: Reading Tabular Data, Commands to Extract Rows and Columns, working with CSV files: reading, writing, analysis, working with JSON Files: reading, writing, Working with XML Files: reading, writing.	**12**
R as a set of statistical tables: Statistics And Probability, Process of Descriptive Analysis, Average, Variance, Standard Deviation in R, Mean, Median and Mode in R, Covariance and Correlation in R, Probability distributions in R:Normal distributions, binomial distributions.	**8**
Statistical testing and modeling in R: Hypothesis testing in R, components of hypothesis test, testing means, testing proportions, testing categorical variables, errors and power.	**8**
Advanced graphics in R: Plotting commands-high level and low level, Graphics parameters list, Device drivers, Dynamic graphics, plot customization, plotting regions and margin,R Histogram, Bar chart, Pie chart, Scatter plots examples.	**12**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

References	
1	Tilman M. Davies, "The book of R: A first course in programming and statistics", San Francisco,
2	Vishwas R. Pawgi, "Statistical computing using R software", Nirali prakashan publisher,1st edition, 2022.
3	https://www.youtube.com/watch?v=KlsYCECWEWEhttps:// www.geeksforgeeks.org/r-tutorial/https://www.tutorialspoint.com/r/index.html

Program Name	**B.C.A**	Semester	**V**
Course Title	**R Programming Lab (Practical)**		
Course Code	**DSC 14 - Lab**	No. of Credits	**02**
Contact hours	**04 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

Course Outcomes:

- Install Code and Use R Programming Language in R Studio IDE to perform basic tasks on Vectors, Matrices and Data frames. Explore fundamentals of statistical analysis in R environment.
- Describe key terminologies, concepts and techniques employed in Statistical Analysis.
- Define Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems.
- Conduct and interpret a variety of Hypothesis Tests to aid Decision Making.
- Understand, analyze and Interpret Correlation Probability and Regression to analyze the underlying relationships between different variables.

1. Write an R program for different types of data structures in R.
2. Write an R program that includes variables, constants, and data types.
3. Write an R program that includes different operators, control structures, default values for arguments, returning complex objects.
4. Write an R program for quick sort implementation.
5. Write a R program for calculating cumulative sums, and products minima,maxima
6. Write an R program for finding stationary distribution of markov chains.
7. Write an R program that includes linear algebra operations on vectors and matrices.
8. Write a R program for any visual representation of an object with creating graphs using graphic functions: Plot(), Hist(), Linechart(), Pie(), Boxplot(), Scatterplots().
9. Write an R program for with any dataset containing data frame objects, indexing and sub setting data frames, and employ manipulating and analyzing data.
10. Write a program to create an any application of Linear Regression in multivariate context for predictive purpose.

Formative Assessment for Practical	
Assessment Occasion/type	**Marks**
Program Writing Any One Program	10 Marks
Execution	10 Marks
viva	05 Marks
Total	**25 Marks**

Program Name	**B.C.A**	Semester	**V**
Course Title	**Software Engineering (Theory)**		
Course Code	**DSC - 15**	No. of Credits	**04**
Contact hours	**52 Hours/4 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**52 Hrs**
OVERVIEW: Introduction, Software engineering ethics; Software process models; Process activities; Coping with change; Agile software development: Agile methods; Plan-driven and agile development.	**10**
REQUIREMENTS ENGINEERING: Functional and non-functional requirements; Software requirements document; Requirement's specification; Requirements engineering processes; Requirement's elicitation and analysis; Requirement's validation; Requirements management.	**10**
SYSTEM MODELING: Context models; Interaction models- Use case modeling, Sequence diagrams; Structural models- Class diagrams, Generalization, Aggregation; Behavioral models- Data-driven modeling, Event-driven modeling; Model-driven engineering.	**10**
ARCHITECTURALDESIGN: Architectural design decisions; Architectural views; Architectural patterns- Layered architecture, Repository architecture, Client–server architecture **DESIGN AND IMPLEMENTATION**: Object-oriented design using the UML- System context and interactions, Architectural design ,Object class identification, Design models, Interface specification; Design patterns; Implementation issues.	**12**
SOFTWARETESTING: Development testing-Unit testing, Choosing unit test cases, Component testing, System testing, Test-driven development; Release testing; User testing-Alpha, Beta, Acceptance testing.	**10**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

Text Books:	
1	Ian Somerville, "Software Engineering", 8th Edition, Pearson Education, 2009.
References Books:	
1	Waman S Jawadekar, "Software Engineering Principles and Practice", Tata McGraw-Hill, 2004.
2	Roger S. Pressman, "A Practitioners Approach", 7th Edition, McGraw-Hill, 2007.
3	P Jalote, "An Integrated Approach to Software Engineering", Narosa Publication.

Program Name	**B.C.A**	Semester	**V**
Course Title	**Cloud Computing (Theory)**		
Course Code	**DSE - E1**	No. of Credits	**03**
Contact hours	**42 Hours /3 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**42 Hrs**
Introduction: Different Computing Paradigms- Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing etc., Comparison of various Computing Technologies; Cloud Computing Basics- What is Cloud Computing? History, Characteristic Features, Advantages and Disadvantages, and Applications of Cloud Computing; Trends in Cloud Computing; Leading Cloud Platform Service Providers.	**8**
Cloud Architecture: Cloud Service Models- Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS), Comparison of different Service Models; Cloud Deployment Models-Public Cloud; Private Cloud, Hybrid Cloud, Community Cloud; Cloud Computing Architecture- Layered Architecture of Cloud. Virtualization- Definition, Features of Virtualization; Types of Virtualizations- Hardware Virtualization, Server Virtualization, Application Virtualization, Pros and Cons of Virtualization, Technology Examples- Xen: Para virtualization, VMware: Full Virtualization, Microsoft Hyper-V.	**10**
Cloud Application Programming and the Aneka Platform: Aneka Cloud Application Platform- Framework Overview, Anatomy of the Aneka Container, Building Aneka Clouds: Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode.	**8**
Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services, Additional Services; Google AppEngine- Architecture and Core Concepts, Application Life-Cycle. **Microsoft Azure**- Azure Core Concepts: Compute, Storage, Core Infrastructure and Other Services, Windows Azure Platform Appliance.	**8**
Cloud Applications: Scientific Applications-Healthcare (ECG Analysis in the Cloud) Geo science (Satellite Image Processing); Business and Consumer Applications - CRM and ERP, Social Networking, Media Applications, Multiplayer Online Gaming.	**8**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

Text Books:	
1	Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi: "Mastering Cloud Computing-Foundations and Applications Programming", Elsevier, 2013.
2	Barrie Sosinsky: "Cloud Computing Bible", Wiley-India, 2010.
3	K Chandrashekaran: "Essentials of Cloud Computing", CRC Press, 2015.
4	Derrick Rountree, Ileana Castrillo: "The Basics of Cloud Computing", Elsevier, 2014.

Program Name	**B.C.A**	Semester	**V**
Course Title	**Business Intelligence (Theory)**		
Course Code	**DSE-E1**	No. of Credits	**03**
Contact hours	**42 Hours /3 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**42 Hrs**
Information Systems Support for Decision Making: An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems, A Framework for Business Intelligence, Business Analytics Overview, Brief Introduction to Big Data Analytics	**8**
Introduction and Definitions, Phases of the Decision Making Process, The Intelligence Phase, Design Phase, Choice Phase, Implementation Phase, Decision Support Systems Capabilities, Classification, Components.	**8**
Basic Concepts of Neural Networks: Developing Neural Network-Based Systems, Illuminating the Black Box of ANN with Sensitivity, Support Vector Machines, And A Process Based Approach to the Use of SVM, Nearest Neighbor Method, Sentiment Analysis Overview, Sentiment Analysis Applications, and Sentiment Analysis Process.	**10**
Decision Support Systems modeling: Structure of mathematical models for decision support, Certainty, Uncertainty, and Risk, Decision modeling with spreadsheets, Mathematical programming optimization, Decision Analysis with Decision Tables and Decision Trees, Multi-Criteria Decision Making With Pair wise Comparisons.	**8**
Automated Decision Systems :The Artificial Intelligence field, Basic concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, and Development of Expert Systems.	**8**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

Text Books:	
1.	Ramesh Sharda, Dursun Delen, Efraim Turban, J. E. Aronson, Ting-Peng Liang, David King, "Business Intelligence and Analytics: System for Decision Support",10th Edition, Pearson Global Edition.
2.	Data Analytics: The Ultimate Beginner's Guide to Data Analytics Paperback–12 November 2017 by Edward Miz
Additional Reading:	
1.	https://shorturl.at/iuAT0
2.	https://www.coursera.org/courses?query=business%20intelligence

Program Name	**B.C.A**	Semester	**V**
Course Title	**Digital Marketing (Theory)**		
Course Code	**Voc-2**	No. of Credits	**03**
Contact hours	**42 Hours /3 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**42 Hrs**
Introduction to Digital Marketing: Overview of digital marketing, Evolution of digital marketing, Importance and benefits of digital marketing, Digital marketing channels and platforms. **Digital Marketing Strategy and Planning:** Developing a digital marketing strategy, Setting goals and objectives, Budgeting and resource allocation.	**8**
Campaign planning and execution, Monitoring and adjusting digital marketing campaigns **Social Media Marketing:** Overview of social media marketing, Social media platforms and their features, Creating and optimizing social media profiles, Social media content strategy, Social media advertising and analytics	**8**
Email Marketing: Introduction to email marketing, Building an email list, Creating effective email campaigns, Email automation and segmentation, Email marketing metrics and analytics. **Content Marketing:** Understanding content marketing, Content strategy and planning,	**8**
Content creation and distribution, Content promotion and amplification, Content marketing metrics and analytics. **Mobile Marketing:** Mobile marketing overview, Mobile advertising strategies, Mobile app marketing, Location-based marketing, Mobile marketing analytics.	**8**
Analytics and Reporting: Importance of analytics in digital marketing, Setting up web analytics tools (e.g., Google Analytics), Tracking and measuring key performance indicators(KPIs),Conversiontrackingandoptimization,Reportinganddatavisualization	**10**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

References	
1	"Digital Marketing Strategy: An Integrated Approach to Online Marketing" by Simon Kings north.
2	"Email Marketing Rules: How to Wear aWhite Hat, Shoot Straight, and Win Hearts" by Chad S. White
3	"Content Inc.: How Entrepreneurs Use Content to Build Massive Audiences and Create Radically Successful Businesses" by Joe Pulizzi
4	"Mobile Marketing: How Mobile Technology is Revolutionizing Marketing, Communications And Advertising" by Daniel Rowles
5	"Web Analytics2.0: The Art of Online Accountability and Science of Customer Centricity" by Avinash Kaushik

Program Name	**B.C.A**	Semester	**V**
Course Title	**Cyber Security (Theory)**		
Course Code	**SEC-4**	No. of Credits	**03**
Contact hours	**42 Hrs /3 Hours per week**	Duration of SEA/Exam	**02 hrs**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**42 Hrs**
Module-I. Introduction to Cyber security: Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.	**12**
Module-II. Cyber-crime and Cyber law: Classification of cyber-crimes, Common cyber-crimes- cyber-crime targeting computers and mobiles, cyber-crime against women and children, financial frauds, social engineering attacks, malware and ransom ware attacks, zero day and zero click attacks, Cybercriminals modus-operandi, Reporting of cyber-crimes, Remedial and mitigation measures, Legal perspective of cyber-crime, IT Act 2000 and its amendments, Cyber-crime and offences, Organizations' dealing with Cyber-crime and Cyber security in India.	**15**
Module III. Social Media Overview and Security: Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hash tag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media.	**15**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

References	
1	Cyber Crime Impact in the New Millennium, by R. C Mishra, Auther Press. Edition 2010
2	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3	Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)

4	Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
5	Fundamentals of Network Security by E. Maiwald, McGraw Hill.
6	Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.

Program Name	**B.C.A**	Semester	**VI**
Course Title	**Artificial Intelligence and Applications (Theory)**		
Course Code	**DSC16**	No. of Credits	**04**
Contact hours	**52 Hours /4 Hours per week**	Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**52 Hrs**
Introduction- What is Artificial Intelligence, Foundations of AI, AI - Past, Present and Future. Intelligent Agents- Environments- Specifying the task environment, Properties of task environments, Agent based programs- Structure of Agents, Types of agents-Simple reflex agents, Model-based reflex agents, Goal-based agents; and Utility-based agents.	**10**
Problem Solving by Searching- Problem-Solving Agents, Well-defined problems and solutions, examples Problems, Searching for Solutions, Uninformed Search Strategies-Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bi directional search	**10**
Knowledge Representation- Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic, First-Order Logic-Syntax and Semantics of First-Order Logic, Using First-Order Logic, Unification and Lifting Forward Chaining, Backward Chaining.	**12**
Learning– Forms of Learning, Supervised Learning- Artificial Neural Networks (ANN), Support Vector Machines (SVM), Unsupervised Learning: Clustering, Association. Advantages and disadvantages of Unsupervised Learning, Hill Climbing Algorithm	**10**
Applications of AI- Natural Language Processing, Text Classification and Information Retrieval, Speech Recognition, Image processing and computer vision, Robotics.	**10**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

Text Books:	
1	Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, 2nd Edition,
2	Tom Mitchell, "Machine Learning", 1st Edition, McGraw-Hill, 2017
3	Elaine Rich, Kevin Knight, Shivashankar B Nair: Artificial Intelligence, Tata McGraw Hill 3rd edition, 2013

Program Name	**B.C.A**	Semester	**VI**
Course Title	**PHP and MySQL (Theory)**		
Course Code	**DSC 17**	No. of Credits	**04**
Contact hours	**52 Hours /4 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**52 Hrs**
Introduction to PHP: Introduction to PHP, History and Features, Installation & Configuration of PHP, Embedding PHP code in Web Pages, HTML and Whitespaces, Writing Comments, Sending Data to the Web Browser, Data types, Keywords, Using Variables, Constants, Expressions, Operators.	**10**
Programming with PHP: Conditional statements: if, if-else, switch, The ? Operator**,** Looping statements: while Loop, do-while Loop, for Loop. **Arrays in PHP:** Introduction- What is Array?, Creating Arrays, Accessing Array elements, Types of Arrays: Indexed v/s Associative arrays, Multidimensional arrays, Creating Array, Accessing Array, Manipulating Arrays, Displaying array, Using Array Functions, Including and Requiring Files- use of Include() and Require(), Implicit and Explicit Casting in PHP.	**12**
Using Functions, Class- Objects, Forms in PHP: Functions in PHP, Function definition, Creating and invoking user-defined functions, Formal parameters versus Actual Parameters, Function and variable scope, Recursion, Library functions, Date and Time Functions. **Strings in PHP:** What is String?, Creating and Declaring String, String Functions.	**10**
Class & Objects in PHP: What is Class & Object, Creating and accessing a Class & Object, Object properties, object methods, Overloading, inheritance, Constructor and Destructor. **Form Handling:** Creating HTML Form, Handling HTML Form data in PHP	**8**
Database handling using PHP with MySQL: Introduction to MySQL: Database terms, Data Types, Using MySQL Client and Using phpMyAdmin, MySQL Commands, PHP MySQL Functions, Connecting to MySQL and Selecting the Database, Executing Simple Queries, Retrieving Query Results.	**12**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

Text Books:	
1	PHP & MySQL for Dynamic Web Sites-Fourth Edition By Larry Ullman.
2	Learning PHP, MySQL and JavaScript By Robin Nixon –O " REILLY Publications.
3	Programming PHP By Rasmus Lerdorf, Kevin Tatroe, Peter Mac Intyre.

Program Name	**B.C.A**	Semester	**VI**
Course Title	**PHP and MySQL Lab**		
Course Code	**DSC 17 - Lab**	No. of Credits	**02**
Contact hours	**04 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

Practical Assignments for PHP Programming

Sl. No	Title of the Experiment
1	Write a PHP script to swap two numbers.
2	Write a PHP script to find the factorial of a number.
3	Write a PHP script to reverse a given number and calculate its sum.
4	Write a PHP script to generate a Fibonacci series using Recursive function.
5	Write a PHP script to implement constructor and destructor.
6	Write a PHP script to implement form handling using get method.
7	Write a PHP script to implement form handling using post method.
8	Write a PHP script that receives form input by the method post to check the number is prime or not.
9	Write a PHP script that receives string as a form input.
10	Write a PHP script to compute addition of two matrices as a form input.
11	Write a PHP script to show the functionality of date and time function.
12	Write a PHP program to upload a file.
13	Write a PHP script to implement database creation.
14	Develop a PHP program to design a college admission form using MYSQL database.

Formative Assessment for Practical	
Assessment Occasion/type	**Marks**
Program Writing Any One Program	10 Marks
Execution	10 Marks
viva	05 Marks
Total	**25 Marks**

Program Name	**B.C.A**	Semester	**VI**
Course Title	**Data Mining and Data Warehouse (Theory)**		
Course Code	**DSC 18**	No. of Credits	**03**
Contact hours	**42 Hours / 3 Hours per week**	Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**42 Hrs**
Data Mining: Introduction, Data Mining Definitions, Knowledge Discovery in Databases (KDD) Vs. Data Mining, DBMS Vs. Data Mining, Data Mining techniques, Problems, Issues and Challenges in DM, DM Applications.	**8**
Data Warehouse: Introduction, Definition, Multidimensional Data Model, Data Cleaning, Data Integration and transformation, Data reduction, Discretization.	**8**
Mining Frequent Patterns: Basic Concept – Frequent Item Set Mining Methods – Apriori and Frequent Pattern Growth (FP-Growth) algorithms-Mining Association Rules.	**8**
Classification: Basic Concepts, Issues, And Algorithms: Decision Tree Induction. Bayes Classification Methods, Rule-Based Classification, Lazy Learners (or Learning from your Neighbours), k-Nearest Neighbour, Prediction, Accuracy-Precision and Recall.	**10**
Clustering: Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering.	**8**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

Text Books:	
1	Jiawei Han and Micheline Kambar –"Data Mining Concepts and Techniques", Second Edition Elsevier Publications.
2	Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2012.
3	Arun K Pujari– "Data MiningTechniques", 4th Edition,Universities Press.
4	K.P.Soman, Shyam Diwakar, V.Ajay: Insight into Data Mining– Theory and Practice, PHI.

Program Name	**B.C.A**	Semester	**VI**
Course Title	**Project Lab**		
Course Code	**DSC 19 - Lab**	No. of Credits	**02**
Contact hours	**04 Hours per week**	Duration of SEA/Exam	**03 hours**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

Guidelines: -

1. The project is of **4 Hours per week** for one (Semester VI) Semester duration.
2. The synopsis approval will be given by the project Guides.
3. The Project work should be a group of not more than five members.
4. The project labs will focus on survey, planning, designing, coding and testing of the project.

Report:

The project proposal should include the following:

- Title
- Introduction
- Literature survey
- Objectives
- Design Details of modules and process logic
- Development/Implementation stages
- Testing Report
- Results

(Any Other Components as per project requirements can be added by Project guide.)

Internal Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal, Attendance, documentation, development work, Report	25 Marks
Total	**25 Marks**

Summative Assessment for Theory	
Assessment Occasion/type	**Marks**
Demo – Presentation	05 Marks
Report	15 Marks
Viva	05 Marks
Total	**25 Marks**

Program Name	**B.C.A**	Semester	**VI**
Course Title	**Digital Image Processing (Theory)**		
Course Code	**DSE - E2**	No. of Credits	**03**
Contact hours	**42 Hours / 3 Hours per week**	Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**42 Hrs**
DIGITAL IMAGE FUNDAMENTALS: Steps in Digital Image Processing – Components –Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models.	**8**
IMAGE ENHANCEMENT: Introduction, Definition, Multidimensional Data Model, Data Cleaning, Data Integration and transformation, Data reduction, Discretization.	**8**
IMAGE RESTORATION: Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters.	**8**
IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation.	**10**
IMAGE COMPRESSION AND RECOGNITION: Need for data compression, Boundary representation, Boundary description, Texture - Patterns and Pattern classes - Recognition based on matching.	**8**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

Text Books:	
1	Rafael C. Gonza Lez and Richard E. Woods. 4th Edition, Pearson Publications.
2	Understanding Digital Image Processing, Vipin Tyagi, 1st Edition, CRC Press.

Program Name	**B.C.A**	Semester	**VI**
Course Title	**Mobile Application Development (Theory)**		
Course Code:	**DSE - E2**	No. of Credits	**03**
Contact hours	**42 Hours / 3 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**42Hrs**
Android OS design and Features: Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools, Building your First Android application.	**8**
Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.	**8**
Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.	**8**
Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.	**8**
Using Common Android APIs: Using Android Data and Storage APIs, Managing data Using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android WebAPIs, Deploying Android Application to the World.	**10**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

Text Books:	
1	Lauren Darcey and Shane Conder , "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2	Reto Meier, "Professional Android2 Application Development", Wiley India Pvt Ltd.
3	Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd.
4	Android Application Development All in one for Dummies by Barry Burd, Edition: I
5	Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India(Wrox) ,2013.

Program Name	**B.C.A**	Semester	**VI**
Course Title	**Web Content Management System (Theory)**		
Course Code	**Voc - 1**	No. of Credits	**03**
Contact hours	**42 Hours /3 Hours per week**	Duration of SEA/Exam	**2 hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**42 Hrs**
Unit 1: Web Content Development and Management, Content Types and Formats, Norms and Guidelines of Content Development, Creating Digital Graphics, Audio Production and Editing,	**8**
Unit 2: Web Hosting and Managing Multimedia Content, Creating and Maintaining a WikiSite, Presentation Software Part I, Presentation Software Part II, Screen casting Tools and Techniques.	**8**
Unit 3: Planning and Developing Dynamic Web Content Sites, Website Design Using CSS Creating and Maintaining a WikiSite, Creating and Managing a Blog Site,	**8**
Unit 4: E- Publication Concept, E- Pub Tools, Simulation and Virtual Reality Applications, Introduction to Moodle, Creating a New Course, uploading new Course.	**10**
Unit 5: Create and Add Assessment, Add and Enroll User and Discussion Forum, Content, Management System: Joomla.	**8**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

Text Books:	
1	Web Content Management: Systems, Features, and Best Practices 1st Edition by Deane Barker.
2	Content Management Bible (2nd Edition) 2nd Edition by Bob Boiko.
3	Moodle for Learning Management System (LMS): A Practical and Visual Guidebook of Administrator and Instructor for Distance Education Paperback– October 12, 2020 by James Koo
4	Using Joomla!: Efficiently Build and Manage Custom Websites, 2nd Edition by Ron Severdia
Additional Reading:	
https://onlinecourses.swayam2.ac.in/cec20_lb09/preview	

Program Name	**B.C.A**	Semester	**VI**
Course Title	**Logical Reasoning (Theory)**		
Course Code	**SEC - 5**	No. of Credits	**03**
Contact hours	**42 Hrs /3 Hours per week**	Duration of SEA/Exam	**02 hrs**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Contents	**42 Hrs**
Arithmetic Reasoning: Analytical Thinking, Syllogistic Logic, Problem solving; Number System; LCM & HCF; Logarithms; Ratio, Proportions and Variations; Partnership; Time speed and distance; work time problems;	**12**
Data Interpretation: Numerical Data Tables; Line Graphs; Bar Charts and Pie charts; Mix Diagrams; Geometrical Diagrams, and other forms of Data Representation	**14**
Lateral Thinking, Reasoning & Logic: Verbal and Non-verbal Logic, Family Tree; Linear Arrangements; Circular and Complex Arrangement; Conditionality and Grouping; Sequencing and Scheduling; Venn Diagram in Logical Reasoning.	**16**

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment	10 Marks
Attendance	10 Marks
Quiz / Assignment / Small Project	10 Marks
Seminar	10 Marks
Total	**40 Marks**

Text Book	
1	R. S. Aggarwal - "A Modern Approach to Verbal and Non–Verbal Reasoning", Sultan Chand and Sons, New Delhi.
References	
1	R. S. Aggarwal – "Quantitative Aptitude", Sultan Chand and Sons, New Delhi.
2	Dr. Ravi Chopra – "Verbal and Non – Verbal Reasoning", Mac Millan India.
3	Dr. Edward De Bono– "Lateral Thinking", Penguin Books, New Delhi.