JSS COLLEGE FOR WOMEN (Autonomous)

Saraswathipuram Mysore-9

NATIONAL EDUCATION POLICY - 2020 (NEP-2020)

Model Curriculum Structures for Bachelor of Science (Basic and Honours) Programmes with Computer Science as Major Course

2021-22

DEPARTMENT OF COMPUTER SCIENCE

IIIA. Model Program Structures for the Under-Graduate Programs in Universities and Colleges in Karnataka

Bachelor of Science (Basic/Hons.) in subjects with practical with both subjects as majors

Sem.	Discipline Core (DSC) (Credits) (L+T+P)	Discipline Elective (DSE) / Open Elective (OE) (Credits) (L+T+P)	Ability Enhancement Compulsory Courses (AECC),		Skill Enhancement Courses (SEC)		Total Credits
					Skill based credits (L+T+P)	Value based (Credits) (L+T+P)	
I	DSC A1(4+2) DSC B1(4+2)	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs. each)	Environmental Studies (3)		Health & Wellness and Yoga (2) (0+0+2)	26
II	DSC A2(4+2) DSC B2(4+2)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs. each)		SEC-1: Digital Fluency (2)(1+0+2)	NCC/NSS/R&R(S&G) /Cultural (2) (0+0+2)	25
Exit option with Certificate (50 credits)							
III	DSC A3(4+2) DSC B3(4+2)	Constitution of India (3)	L1-3(3), L2-3(3) (4 hrs. each)		SEC-2: Artificial Inte- lligence (2)(1+0+2]	NCC/NSS/R&R(S&G)/Cultural (2)(0+0+2)	25
IV	DSC A4(4+2) DSC B4(4+2)	OE-4 (3)	L1-4(3), L2-4(3) (4 hrs. each)		SEC-3: Financial Investment and Awareness (2) (1+0+2)	NCC/NSS/R&R(S&G)/Cultural (2)(0+0+2)	25
Exit option with Diploma (100 credits) or continue the third year with both the subjects as majors							
V	DSC A5(4+2), DSC A6(4+2) DSC B5(4+2), DSC B6(4+2)				SEC-3: Employability Skill (3) (1+0+2)		27
VI	DSC A7(4+2), DSC A8(4+2) DSC B7(4+2) DSC B8(4+2)				Internship (2)		26
Exit option with Bachelor of Arts, B.A./ Bachelor of Science, B. Sc. Basic Degree (146 credits) or Choose one of the DSCs as Major							

Model Curriculum Structure

Computer Science as MAJOR with another Subject also as MAJOR (Table IIIA of Model Curriculum)

Sem	DSC Specific Core Courses (DSC)	Hour of Teaching/ Week		DSC Specific Elective Courses (DSE)	Hour of Teaching/ Week
		Theory	Lab		
1	DSC-1: Computer Fundamentals and Programming in C DSC-1Lab: C Programming Lab	4	 4		
2	DSC-2: Data Structures using C DSC-2Lab: Data structures Lab	4	 4		
3	DSC-3: Object Oriented Programming Concepts and Programming in JAVA DSC-3Lab: JAVA Lab	4	 4		
4	DSC-4: Database Management Systems DSC-4Lab: DBMS Lab	4	 4		
5	DSC-5: Programming in PYTHON DSC-6: Computer Networks DSC-5Lab: PYTHON Programming lab DSC-6Lab: Computer Networks Lab	3 3	 4 4		
6	DSC-7: Internet Technologies DSC-8: Operating System Concepts DSC-7Lab: JAVA Script, HTML, CSS Lab DSC-8Lab: C# Programming Lab	3 3	 4 4		
7	DSC-9: Computer Graphics and Visualization DSC-10: Design and Analysis of Algorithms DSC-11: Software Engineering DSC-9Lab: Computer Graphics and Visualization Lab DSC-10Lab: Algorithms Lab	3 3 3	 4 4	DSE-1: Any one from DSC Specific Elective Courses, Group – 1** DSE-2: Any one from DSC Specific Elective Courses, Group – 2** Research Methodology:	3 3 3
8	DSC-12: Artificial Intelligence and Applications DSC-13: Computer Organization and Architecture DSC-14: Data Warehousing and Data Mining DSC-12 Lab: AI Lab	3 3 3	 4	DSE-3: Any one from DSC Specific Elective Courses, Group – 3** Research Project:	3 6

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SARASWATHIPURAM MYSURU-570009

NEP Syllabus – B.Sc. for 2021-22 onwards

Year	Sem	Corse Code	Title	Hours / Week			Credits			Maximum Marks						Exam Duration	Total Marks
										Th IA		Pr IA		Exam			
				L	T	P	L	T	P	C1	C2	C1	C2	Th	Pr		
I	I	GMA 280	Computer Fundamentals and Programming in C	4	0	0	4	0	0	20	20	-	-	60	-	$2^1/_2$ Hours	100
		GMA 280P	C Programming Lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
	II	GMB 280	Data Structures using C	4	0	0	4	0	0	20	20	-	-	60	-	$2^1/_2$ Hours	100
		GMB 280P	Data structures Lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
II	III	GMC 280	Object Oriented Programming Concepts and Programming in JAVA	4	0	0	4	0	0	20	20	-	-	60	-	$2^1/_2$ Hours	100
		GMC 280P	JAVA Lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
	IV	GMD 280	Database Management Systems	4	0	0	4	0	0	20	20	-	-	60	-	$2^1/_2$ Hours	100
		GMD 280P	DBMS Lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
III	V	GME 280	Programming in PYTHON	4	0	0	4	0	0	20	20	-	-	60	-	$2^1/_2$ Hours	100
		GME 282	Computer Networks	4	0	0	4	0	0	20	20	-	-	60	-	$2^1/_2$ Hours	100
		GME 280P	PYTHON Programming lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
		GME 282P	Computer Networks Lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
		GME300	SEC-3 Cyber Security/ Employability	2	0	2	2	0	1	20	20	-	-	60	-	$2^1/_2$ Hours	100
	VI	GMF 280	Web Technologies	4	0	0	4	0	0	20	20	-	-	60	-	$2^1/_2$ Hours	100
		GMF 282	Statistical Computing & R Programming	4	0	0	4	0	0	20	20	-	-	60	-	$2^1/_2$ Hours	100
		GMF 280P	JAVA Script, HTML, CSS	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
		GMF 282P	R Programming Lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
		GMF 300P	Internship	2	0	2	2	0	1	20	20	-	-	60	-	$2^1/_2$ Hours	100

Year	Sem	Corse Code	Title	Hours / Week			Credits			Maximum Marks						Exam Duration	Total Marks
										Th IA		Pr IA		Exam			
				L	T	P	L	T	P	C1	C2	C1	C2	Th	Pr		
IV	VII	DSC-9	Computer Graphics and Visualization	3	0	0	3	0	0	20	20	-	-	60	-	2 Hours	100
		DSC-10	Design and Analysis of Algorithms	3	0	0	3	0	0	20	20	-	-	60	-	2 Hours	100
		DSC-11	Software Engineering	3	0	0	3	0	0	20	20	-	-	60	-	2 Hours	100
		DSC-9 Lab	Computer Graphics and Visualization Lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
		DSC-10 Lab	Algorithms Lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
		DSE-1	Elective: Any one IoT Cyber Law and Cyber Security Web Programming - PHP and MySQL Clouds, Grids, and Clusters Software Testing	3	0	0	3	0	0	20	20	-	-	60	-	2 Hours	100
		DSE-2	Elective: Any one Information and Network Security Data Compression Discrete Structures Open source Programming Multimedia Computing Big Data	3	0	0	3	0	0	20	20	-	-	60	-	2 Hours	100
			Research Methodology	3	0	0	3	0	0	20	20	-	-	60	-	2 Hours	100
	VIII	DSC-12	Artificial Intelligence and Applications	3	0	0	3	0	0	20	20	-	-	60	-	2 Hours	100
		DSC-13	Computer Organization and Architecture	3	0	0	3	0	0	20	20	-	-	60	-	2 Hours	100
		DSC-14	Data Warehousing and Data	3	0	0	3	0	0	20	20	-	-	60	-	2 Hours	100

			Mining														
		DSC-12 Lab	AI	**0**	**0**	**4**	**0**	**0**	**2**	**-**	**-**	**10**	**15**	**-**	**25**	**3 Hours**	**50**
		DSE-3	Elective: Any one • Data Analytics • Storage Area Networks • Pattern Recognition • Digital Image Processing • Parallel Programming Digital Signal Processing	**3**	**0**	**0**	**3**	**0**	**0**	**20**	**20**	**-**	**-**	**60**	**-**	**2 Hours**	**100**
			Research Project	**0**	**0**	**12**	**0**	**0**	**6**	**-**	**-**	**20**	**20**	**-**	**60**	**2 Hours**	**100**

Model Syllabus for BSc (Basic and Honors),

B.Sc.: Semester: I

DSC-1 Course Code: GMA 280	**Course Title:** Computer Fundamentals and Programming in C
Course Credits: 04	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: $2^1/_2$ hrs

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	
Fundamentals of Computers: Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types 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. **Introduction to C Programming:** Over View of C; History and Features of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C.	13
Unit - 2	
C Programming Basic Concepts: C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration & initialization of variables; Symbolic constants. **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. **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.	13
Unit - 3	

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. Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation. Strings: Declaring & Initializing string variables; String handling functions - *strlen, strcmp, strcpy and strcat;* Character handling functions - *toascii, toupper, tolower, isalpha, isnumeric* etc.	13
Unit - 4	
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; **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.	13

Text Books

1. Pradeep K. Sinha and Priti Sinha: Computer Fundamentals (Sixth Edition), BPB Publication
2. E. Balgurusamy: Programming in ANSI C (TMH)

References

1. Kamthane: Programming with ANSI and TURBO C (Pearson Education)
2. V. Rajaraman: Programming in C (PHI – EEE)
3. S. ByronGottfried: Programming with C (TMH)
4. Kernighan & Ritche: The C Programming Language (PHI)
5. Yashwant Kanitkar: Let us C
6. P.B. Kottur: Programming in C (Sapna Book House)

DSC-1Lab Course Code: **GMA 280P**	**Course Title: C Programming Lab**
Course Credits: 02	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03

Practice Lab

The following activities be carried out/ discussed in the lab during the initial period of the semester.

1. Basic Computer Proficiency a. Familiarization of Computer Hardware Parts
b. Basic Computer Operations and Maintenance.
c. Do's and Don'ts, Safety Guidelines in Computer Lab

2. Familiarization of Basic Software – Operating System, Word Processors, Internet Browsers, Integrated Development Environment (IDE) with Examples.
3. Type Program Code, Debug and Compile basic programs covering C Programming fundamentals discussed during theory classes.

Programming Lab

Part A:

1. Write a C Program to read radius of a circle and to find area and circumference
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*
4. Write a C Program to check for prime
5. Write a C Program to generate n primes
6. Write a C Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
7. Write a C Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers
8. Write a C Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder)
9. Write a C Program to find the roots of quadratic equation (demonstration of switch-case statement)
10. Write a C program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
11. Write a C Program to remove Duplicate Element in a single dimensional Array
12. 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.
3. Write a C Program to demonstrate pointers in C
4. Write a C Program to check a number for prime by defining *isprime( )* function
5. Write a C Program to read, display and to find the trace of a square matrix
6. Write a C Program to read, display and add two m x n matrices using functions
7. Write a C Program to read, display and multiply two m x n matrices using functions
8. Write a C Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.
9. Write a C Program to Reverse a String using Pointer
10. Write a C Program to Swap Two Numbers using Pointers
11. Write a C Program to demonstrate student structure to read & display records of n students.
12. Write a C Program to demonstrate the difference between structure & union.

Note: Student has to execute a minimum of 10 programs in each part to complete the Lab course

Evaluation Scheme for Lab Examination	**Assessment Criteria**	**Marks**
Program – 1 from Part A	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Viva Voice based on C Programming		05
Total		**25**

B.Sc. : Semester II

DSC-2 Course Code: **GMB 280**	**Course Title:** Data Structures using C
Course Credits: 04	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: $2^1/_2$ 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 and searching

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 Technique Examples - Fibonacci numbers, GCD, Binomial coefficient nCr, Towers of Hanoi; Comparison between iterative and recursive functions.	13
Unit - 2	
Arrays: Basic Concepts – Definition, Declaration, Initialisation, 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, Selection sort, Insertion sort; Searching - Sequential Search, Binary search; Iterative and Recursive searching; Multidimensional arrays; Representation of multidimensional arrays; Sparse matrices. Dynamic memory allocation: Static & Dynamic memory allocation; Memory allocation and de-allocation functions - *malloc*, *calloc*, *realloc* and *free.*	13
Unit - 3	
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. 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.	13

Unit - 4	
Queues: Basic Concepts – Definition and Representation of queues; Types of queues - Simple queues, Circular queues, Double ended queues, Priority queues; Operations on Simple queues; 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.	13

Text Books

1. Satraj Sahani: 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))

DSC-2 Lab Course Code: **GMB 280P**	**Course Title: Data Structures Lab**
Course Credits: 02	Hour of Teaching/Week: 04
Total Contact Hours: 52	Formative Assessment Marks: 25
Exam Marks: 25	Exam Duration: 03

Programming Lab

Part A:

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

Part B:

1. Program to sort the given list using insertion sort technique.
2. Program to sort the given list using merge sort technique.
3. Program to sort the given list using quick sort technique.
4. Program to implement Stack. (Using Linked List)
5. Program to implement simple queue. (Using Linked List)
6. Program to implement Circular Queue. (Using Linked List)
7. Program to implement Search an Element in linear linked list.
8. Program to implement Doubly linked list
9. Program to display traversal of a tree.

Evaluation Scheme for Lab Examination

Assessment Criteria		**Marks**
Program – 1 from Part A	Flowchart / Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Program -2 from Part B	Flowchart/Algorithm	02
	Writing the Program	05
	Execution and Formatting	03
Viva Voice based on C Programming		05
Total		**25**

B.Sc Semester III

DSC-3 Course code: GMC280	Course Title: Object Oriented Programming in Java
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 40	Duration of SEE/Exam: $2^1/_2$ Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

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

- Explain the object-oriented concepts and JAVA.
- Write JAVA programs using OOP concepts like Abstraction, Encapsulation, Inheritance and Polymorphism.
- Implement Classes and multithreading using JAVA.
- Demonstrate the basic principles of creating Java applications with GUI.

Unit	Description	Hours
1	**Introduction to Java:** Basic OOPs concepts, Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Arrays in java. **Objects and Classes:** Basics of objects and classes in java, Constructors, Visibility modifiers.	13
2	Methods and objects, Inbuilt classes like String, Character, String Buffer, this reference. **Inheritance and Polymorphism:** Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java.	13
3	**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,	13
4	**I/O programming:** Text and Binary I/O, Binary I/O classes, Object I/O. Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try catch-finally, Applet and its life cycle.	13

References:

1. Object Oriented Programming with Java: Somashekara M.T., Guru, D.S., Manjunatha K.S, 1st Edition, PHI Learning 2017.
2. Programming with Java, By E Balagurusamy – A Primer, 4th Edition, McGraw Hill Publication.
3. Core Java Volume I – Fundamentals, By Cay S. Horstmann, Prentice Hall.
4. Java 2 - The Complete Reference, Herbert Schildt, 5th Edition, McGraw Hill Publication, 2017.
5. Java - The Complete Reference, Herbert Schildt, 7th Edition, McGraw Hill Publication, 2017.

DSC-3 Lab Course code: GMC 280P	Course Title: Java Programming Lab
Total Contact Hours: 52	Hours/week : 04
Formative Assessment Marks: 25	Course Credits: 02
Exam Marks: 25	Duration of Exam: 03 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

Java Programming Lab

1. **PART A: Fundamentals of OOPs in Java**
2. Program to assign two integer values to X and Y. Using the „if‟ statement the output of the program should display a message whether X is greater than Y.
3. Program to list the factorial of the numbers 1 to 10. To calculate the factorial value, use while loop. (Hint Fact of 4 = 4*3*2*1)
4. 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.
5. 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.
6. 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.
7. Program
    a. To find the area and circumference of the circle by accepting the radius from the user.
    b. To accept a number and find whether the number is Prime or not
8. Program to create a student class with following attributes; Enrollment No: Name, Mark of sub1, Mark of sub2, mark of sub3, Total Marks. 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 three student objects and display the details.
9. 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

10. 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:

11. 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 to handle Null Pointer Exception and use the "finally" method to display a message to the user.
3. Program which create and displays a message on the window

4. Program to draw several shapes in the created window
5. Program to create an applet and draw grid lines
6. 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.
7. Create a frame which displays your personal details with respect to a button click
8. Create a simple applet which reveals the personal information of yours.
9. Program to move different shapes according to the arrow key pressed.
10. Demonstrate the various mouse handling events using suitable example.

Evaluation Scheme for Lab Examination:

Assessment Criteria	**Marks**
Writing 2 Programs	10
Execution of 1 Program	10
Viva and Record	05
Total	25

B.Sc.: Semester IV

DSC-4 Course code: GMD 280	Course Title: Database Management System
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 40	Duration of SEE/Exam: $2^1/_2$ Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

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

- Explain 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 draw ER diagram for a given real-world problem.
- Convert an ER diagram to a database schema and deduce it to the desired normal form.
- Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- Explain the transaction processing and concurrency control techniques.

Unit	Description	Hours
1	**Database Architecture:** Introduction to Database system applications. Characteristics and Purpose of database approach. People associated with Database system. Data models. Database schema. Database architecture. Data independence. Database languages, interfaces, and classification of DBMS. **E-R Model:** Entity-Relationship modeling: E – R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute.	13
2	Relationships between the entities. Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E-R diagram. **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. Relational Algebra: Basic Relational Algebra operations. Set theoretical operations on relations. JOIN operations Aggregate Functions and Grouping. Nested Sub Queries-Views.	13
3	**Data Normalization:** Anomalies in relational database design. Decomposition. Functional dependencies - Axioms, Minima and Maxima covers. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.	13
4	**Query Processing Transaction Management:** Introduction Transaction Processing. Single user & multiuser systems. Transactions: read & write operations. Need of concurrency control: The lost update problem, Dirty read problem. Types of failures. Transaction states. Desirable properties (ACID properties) of Transactions.	13

References:

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

DSC-4 Lab Course code: GMD 280P	Course Title: DBMS Lab
Total Contact Hours: 52	Hours/week : 04
Formative Assessment Marks: 25	Course Credits: 02
Exam Marks: 25	Duration of Exam: 03 Hours

Course Outcomes (COs):

Student would be able to create tables, execute queries

1. Execute a single line query and group functions.
2. Execute DDL Commands.
3. Execute DML Commands
4. Execute DCL and TCL Commands.
5. Implement the Nested Queries.
6. Implement Join operations in SQL
7. Create views for a particular table
8. Implement Locks for a particular table

Activity 1:

Database: Student (DDL, DML Statements)

Table: Student

Name	RegNo	Class	Major
Smith	17	1	CS
Brown	8	2	CS

Table: Course

CourseName	CourseNumber	CreditHours	Department
Introduction to Computer Science	CS1310	4	CS
Data Structure	CS3320	4	CS
Discrete Mathematics	MATH2410	3	MATH
Database Management Systems	CS3380	3	CS

Table: Section

Section_Identifier	CourseNumber	Year	Instructor
85	MATH2410	98	King
92	CS1310	98	Andreson
102	CS3320	99	Knuth
112	MATH2410	99	Chang
119	CS1310	99	Andreson
135	CS3380	99	Stone

Table: Grade_Report

RegNo	Section_Identifier	Grade
17	112	B
17	119	C
8	85	A
8	92	A
8	102	B
8	135	A

Create Tables using create statement

Insert rows to individual tables using insert statement
Alter table section add new field section and update the records
Delete brown's grade report
Drop the table section

Activity 2: (Select clause, Arithmetic Operators)
Database: Employee
Create Following tables and insert tuples with suitable constraints
Table: Employee

Emp_Id	First_Name	Last_Name	Hire_Date	Address	City
1001	George	Smith	11-May-06	83 first street	Paris
1002	Mary	Jones	25-Feb-08	842 Vine Ave	Losantiville
1012	Sam	Tones	12-Sep-05	33 Elm St.	Paris
1015	Peter	Thompson	19-Dec-06	11 Red Road	Paris
1016	Sarath	Sharma	22-Aug-07	440 MG Road	New Delhi
1020	Monika	Gupta	07-Jun-08	9 Bandra	Mumbai

Table: Empsalary

Emp_Id	Salary	Benefits	Designation
1001	10000	3000	Manager
1002	8000	1200	Salesman
1012	20000	5000	Director
1015	6500	1300	Clerk
1016	6000	1000	Clerk
1020	8000	1200	Salesman

Write queries for the following

1. To display FIRSTNAME, LASTNAME, ADDRESS AND CITY of all employees living in PARIS.
2. To display the content of employee table in descending order of FIRSTNAME
3. Select FIRSTNAME and SALARY of salesman
4. To display the FIRSTNAME, LASTNAME, AND TOTAL SALARY of all employees from the table EMPLOYEE and EMPSALARY. Where TOTAL SALARY is calculated as SALARY+BENEFITS
5. List the Names of employees, who are more than 1 year old in the organization
6. Count number of distinct DESINGATION from EMPSALARY
7. List the employees whose names have exactly 6 characters
8. Add new column PHONE_NO to EMPLOYEE and update the records
9. List employee names, who have joined before 15-Jun-08 and after 16-Jun-07
10. Generate Salary slip with Name, Salary, Benefits, HRA-50%, DA-30%, PF-12%, Calculate gross. Order the result in descending order of the gross.

Activity 3: (Logical, Relational Operators)

Database: Library
Create Following **tables** and insert **tuples** with suitable constraints

Table: Books

Book_Id	Book_Name	Author_Name	Publishers	Price	Type	Quantity
C0001	The Klone and I	Lata Kappor	EPP	355	Novel	5
F0001	The Tears	William Hopkins	First Publ	650	Fiction	20
T0001	My First C++	Brain & Brooke	ERP	350	Text	10
T0002	C++ Brainwork‟s	A.W.Rossaine	TDH	350	Text	15
F0002	Thunderbolts	Ana Roberts	First Publ.	750	Fiction	50

Table: Issued

Book_ID	Quantity_issued
T0001	4
C0001	5
F0001	2
T0002	5
F0002	8

Write queries for the following

1. To show Book name, Author name and price of books of **First Publ**. publisher
2. Display Book id, Book name and publisher of books having quantity more than 8 and price less than 500
3. Select Book id, book name, author name of books which is published by other than ERP publishers and price between 300 to 700
4. Generate a Bill with Book_id, Book_name, Publisher, Price, Quantity, 4% of VAT “Total”
5. Display book details with book id‟s C0001, F0001, T0002, F0002 (Hint: use IN operator)
6. Display Book list other than, type Novel and Fiction
7. Display book details with author name starts with letter „A‟
8. Display book details with author name starts with letter „T‟ and ends with „S‟
9. Select Book_Id, Book_Name, Author Name , Quantity Issued where Books.Books_Id = Issued.Book_Id
10. List the book_name, Author_name, Price. In ascending order of Book_name and then on descending order of price

Activity 4: (Date Functions)

Database: Lab

Create Following **table** and insert **tuples** with suitable constraints

Table: Equipment_Details

No.	ItemName	Costperitem	Quantity	Dateofpurchase	Warranty	Operational
1	Computer	30000	9	21/5/07	2	7
2	Printer	5000	3	21/5/06	4	2
3	Scanner	8000	1	29/8/08	3	1
4	Camera	7000	2	13/6/05	1	2
5	UPS	15000	5	21/5/08	1	4
6	Hub	8000	1	31/10/08	2	1
7	Plotter	25000	2	11/1/09	2	2

(Use date functions and aggregate functions)

1. To select the ItemName purchase after 31/10/07
2. Extend the warranty of each item by 6 months
3. Display ItemName , Dateof purchase and number of months between purchase date and present date
4. To list the ItemName in ascending order of the date of purchase where quantity is more than 3.
5. To count the number, average of costperitem of items purchased before 1/1/08
6. To display the minimum warranty , maximum warranty period
7. To Display the day of the date , month , year of purchase in characters
8. To round of the warranty period to month and year format.
9. To display the next Sunday from the date "07-JUN-96"
10. To list the ItemName, which are within the warranty period till present date

Activity 5: (Numeric, character functions)
Use Functions for the following

1. Find the mod of 165,16
2. Find Square Root of 5000
3. Truncate the value 128.3285 to 2 and -1 decimal places
4. Round the value 92.7683 to 2 and -1 decimal places
5. Convert the string „Department" to uppercase and lowercase
6. Display your address convert the first character of each word to uppercase and rest are in lowercase
7. Combine your first name and last name under the title Full name
8. A) Take a string length maximum of 15 displays your name to the left. The remaining space should be filled with „*"
9. Take a string length maximum of 20 displays your name to the right. The remaining space should be filled with „#"
10. Find the length of the string „JSS College, Mysore"
11. Display substring „BASE" from „DATABASE"
12. Display the position of the first occurrence of character „o" in Position and Length
13. Replace string Database with Data type
14. Display the ASCII value of „ „ (Space)
15. Display the Character equivalent of 42

Activity 6:
Database: Subject
Create Following **table** and insert **tuples** with suitable constraints
Table - Physics

Regno	Name	Year	Combination
AJ00325	Ashwin	First	PCM
AJ00225	Swaroop	Second	PMCs
AJ00385	Sarika	Third	PME
AJ00388	Hamsa	First	PMCs

Table – Computer Science

Regno	Name	Year	Combination
AJ00225	Swaroop	Second	PMCs
AJ00296	Tajas	Second	BCA
AJ00112	Geetha	First	BCA
AJ00388	Hamsa	First	PMCs

1. Select all students from physics and Computer Science
2. Select student common in physics and Computer Science
3. Display all student details those are studying in second year
4. Display student those who are studying both physics and computer science in second year
5. Display the students studying only physics
6. Display the students studying only Computer Science
7. select all student having PMCs combination
8. select all student having BCA combination
9. select all student studying in Third year
10. Rename table Computer Science to CS

Activity 7: (views)

Database: Railway Reservation System

Create Following **table** and insert **tuples** with suitable constraints

Table: Train Details

Train_No	Train_Name	Start_Place	Destination
RJD16	Rajdhani Express	Bangalore	Mumbai
UDE04	Udhyan Express	Chennai	Hyderabad
KKE55	Karnataka Express	Bangalore	Chennai
CSE3	Shivaji Express	Coimbatore	Bangalore
JNS8	Janashatabdi	Bangalore	Salem

Table: Availability

Train_No	Class	Start_Place	Destination	No_of_seats
RJD16	Sleeper Class	Bangalore	Mumbai	15
UDE04	First Class	Chennai	Hyderabad	22
KKE55	First Class AC	Bangalore	Chennai	15
CSE3	Second Class	Coimbatore	Bangalore	8
JNS8	Sleeper Class	Bangalore	Salem	18

1. Create view **sleeper** to display train no, start place, destination which have sleeper class and perform the following
    a. insert new record
    b. update destination="Manglore" where train no="RJD16"
    c. delete a record which have train no="KKE55"
2. Create view **details** to display train no, train name, class
3. Create view **total_seats** to display train number, start place, use count function to no of seats , group by start place and perform the following
    a. insert new record
    b. update start place="Hubli" where train no="JNS8"
    c. delete last row of the view
4. Rename view sleeper to class

5. Delete view details

Evaluation Scheme for Lab Examination: Assessment Criteria	**Marks**
Writing 2 Programs	10
Execution of 1 Program	10
Viva and Record	05
Total	25

B.Sc.: Semester V

DSC-5 Course code: GME 280	Course Title: Programming in Python
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 40	Duration of SEE/Exam: $2^1/_2$ Hours
Summative Assessment Marks: 60	

Course Outcomes (COs): After the successful completion of the course, the student will be able to:
CO1: Setup python to develop simple applications
CO2: Understand the basic concepts in Python Programming
CO3: Learn how to write, debug and execute Python programs
CO4: Understand and demonstrate the use of advanced data types such as tuples, dictionaries and lists, Tuples and Sets
CO5: Design solutions for problems using object-oriented concepts in Python
CO6: Use and apply the different Python Libraries for GUI Interface, Data Analysis and Data Visualization
CO7: Extend the knowledge of python programming to build successful career in software development

Unit	Contents	52hours
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.	**13hrs**
Unit 2	**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. **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 **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.	**13hrs**
Unit 3	**Tuples and Sets:** Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods.	**13hrs**

	File Handling: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator. **Object Oriented Programming:** Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, Private Instance Variables; Polymorphism- Definition, Operator Overloading.	
Unit 4	**GU Interface:** The Tkinter Module; Window and Widgets; Layout Management- pack, grid and place. **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. **Data Analysis:** NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames. **Data Visualisation:** Introduction to Data Visualisation; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart.	**13hrs**

References	
1	**Think Python How to Think Like a Computer Scientist,** Allen Downey et al., 2nd Edition, 2015, Green Tea Press. Freely available online @ https://www.greenteapress.com/thinkpython/thinkCSpy.pdf
2	**Introduction to Python Programming**, Gowrishankar S et al.,2019, CRC Press
3	**Python Data Analytics**: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, 2015, Apress®
4	**Advance Core Python Programming**, Meenu Kohli, 2021, BPB Publications
5	**Core PYTHON Applications Programming**, Wesley J. Chun, 3rd Edition, 2012, Prentice Hall
6	**Automate the Boring Stuff**, Al Sweigart, 2015, No Starch Press, Inc.
7	**Data Structures and Program Design Using Python**, D Malhotra et al., 2021, Mercury Learning and Information LLC
8	http://www.ibiblio.org/g2swap/byteofpython/read/
9	https://docs.python.org/3/tutorial/index.html

DSC-5 Lab Course code: GME 280P	Course Title: Python Programming Lab
Total Contact Hours: 52	Hours/week : 04
Formative Assessment Marks: 25	Course Credits: 02
Exam Marks: 25	Duration of Exam: 03 Hours

Part-A

1. Check if a number belongs to the Fibonacci Sequence
2. Solve Quadratic Equations
3. Find the sum of n natural numbers
4. Display Multiplication Tables
5. Check if a given number is a Prime Number or not
6. Implement a sequential search
7. Create a calculator program
8. Explore string functions
9. Implement Selection Sort
10. Implement Stack
11. Read and write into a file

Part-B

1. Demonstrate usage of basic regular expression
2. Demonstrate use of advanced regular expressions for data validation.
3. Demonstrate use of List
4. Demonstrate use of Dictionaries
5. Create SQLite Database and Perform Operations on Tables
6. Create a GUI using Tkinter module
7. Demonstrate Exceptions in Python
8. Drawing Line chart and Bar chart using Matplotlib
9. Drawing Histogram and Pie chart using Matplotlib
10. Create Array using NumPy and Perform Operations on Array
11. Create Data Frame from Excel sheet using Pandas and Perform Operations on DataFrames

Note: A minimum of 10 Programs should be done in each Part.

Evaluation Scheme for Lab Examination: Assessment Criteria	**Marks**
Writing 2 Programs	10
Execution of 1 Program	10
Viva and Record	05
Total	25

B.Sc.: Semester V

DSC-6 Course code: GME 282	Course Title: Computer Networks
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 40	Duration of SEE/Exam: $2^1/_2$ Hours
Summative Assessment Marks: 60	

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

- Define various data communication components in networking
- Describe networking with reference to different types of models and topologies
- Understand the need for Network and various layers of OSI and TCP/IP reference model
- Explain various Data Communications media
- Describe the physical layer functions and components
- Identify the different types of network topologies and Switching methods
- Describe various Data link Layer Protocols
- Identify the different types of network devices and their functions within a network
- Analyse and interpret various Data Kink Layer and Transport Layer protocols
- Explain different application layer protocols

Unit	Contents	52hours
Unit 1	**Introduction:** Computer Network: Definition, Goals, Structure; Broadcast and Point-To-Point Networks; Network Topology and their various Types; Types of Networks, Network software, Design issues for the layers, Connection-oriented vs. Connectionless service, Applications of Computer network, Protocols and Standards, The OSI Reference Model, The TCP/IP Protocol suite, Comparison between OSI and TCP/IP Reference model.	**13hrs**
Unit 2	**Physical Layer:** Functions of Physical Layer**,** Analog signals, Digital signals, Transmission Impairment, Data Rate Limits, and Performance. Data Transmission Media: Guided Transmission Media, Magnetic Media, Twisted Pairs, Coaxial Cable, Power Lines, Fiber Optics, Wireless Transmission, Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared Transmission, Light Transmission, Digital Modulation and Multiplexing, Public Switched Telephone Networks. Switching: Circuit switching, Message switching & Packet switching	**13hrs**
Unit 3	**Data Link Layer:** Functions of Data Link Layer, Data Link Control: Framing, Flow and Error Control, Error Detection and Correction, High-Level Data Link Control (HDLC) & point to Point protocol (PPP), Channel Allocation Problem, Multiple Access: Radom Access (ALOHA, CSMA, CSMA/CD, CSMA/CA), Controlled Access (Reservation, Polling, Token Passing), Channelization (FDMA, TDMA, CDMA), **Wired LAN:** Ethernet Standards and FDDI, Wireless LAN: IEEE 802.1 Ix and Bluetooth Standards.	**13hrs**
Unit 4	**Transport Layer:** Functions of Transport Layer, Elements of Transport Protocols: Addressing, Establishing and Releasing Connection, Flow Control & Buffering, Error Control, Multiplexing & De-multiplexing, Crash Recovery, **User Datagram Protocol (UDP):** User Datagram, UDP Operations, Uses of	**13hrs**

	UDP, RPC, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocol, Go Back-N(GBN), Selective Repeat (SR). **Application layer:** Functions of Application layer, Application Layer Protocols: DNS, DHCP, WWW, HTTP, HTTPs, TELNET, FTP, SMTP, POP, IIMAP	

References	
Reference Books:	
1	Andrew S Tanenbaum, David. J. Wetherall, ―Computer Networks‖, Pearson Education, 5th Edition,
2	Behrouz A. Forouzan, "Data Communications and Networking", Tata McGraw-Hill, Fourth Edition
3	Kurose and Ross, Computer Networking- A Top-Down approach, Pearson, 5th edition
4	William Stallings, Data and Computer Communications, 7th Edition,PHI.
4	http://highered.mheducation.com/sites/0072967757/index.html
7	Larry L. Peterson, Bruce S. Davie, ―Computer Networks: A Systems Approach‖, Morgan Kaufmann Publishers, Fifth Edition, 2011.
8	Brijendrasingh, Data Communication and Computer Networks,PHI.

DSC-6 Lab Course code: GME 290P	Course Title: Computer Networks Lab
Total Contact Hours: 52	Hours/week : 04
Formative Assessment Marks: 25	Course Credits: 02
Exam Marks: 25	Duration of Exam: 03 Hours

Part A:

1. Prepare hardware and software specification for basic computer system and Networking.
2. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
3. Identifying the networking devices on a network.
4. Configure the IP address of the computer.
5. Create a basic network and share file and folders.
6. Study of basic network command and Network configuration commands.
7. Installation process of any open-source network simulation software.

Part B:

1. Implement connecting two nodes using network simulator.
2. Implement connecting three nodes considering one node as a central node using network simulator. Implement a network to connect three nodes considering one node as a central node using network simulator
3. Implement bus topology using network simulator.
4. Implement star topology using network simulator.
5. Implement ring topology using network simulator.
6. Demonstrate the use of wireless LAN using network simulator.
7. Implement FTP using TCP bulk transfer using network simulator.
8. Implement connecting multiple routers and nodes and building a Hybrid topology network simulator.

Links for open-source simulation software:

- NS3 software: https://www.nsnam.org/releases/ns-3-30/download/
- Packet Tracer Software: https://www.netacad.com/courses/packet-tracer
- GNS3 software: https://www.gns3.com/

Evaluation Scheme for Lab Examination: Assessment Criteria	**Marks**
Writing 2 Programs	10
Execution of 1 Program	10
Viva and Record	05
Total	25

B.Sc.: Semester VI

DSC-7 Course code: GMF 280	Course Title: Web Technologies
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 40	Duration of SEE/Exam: $2^1/_2$ Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

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

- Understand basics of web technology
- Recognize the different Client-side Technologies and tools like, HTML, CSS, JavaScript
- Learn Java Servlets and JDBC
- Web Technology for Mobiles and Understand web security

Unit	Contents	52hours
Unit 1	**Introduction and Web Design:** Introduction to Internet, WWW and Web 2.0, Web browsers, Web protocols and Web servers, Web Design Principles and Web site structure, client-server technologies, Client-side tools and technologies, Server-side Scripting, URL, MIME, search engine, web server-Apache, IIS, proxy server, HTTP protocol. Introductions to HTML. HTML5 Basics tags, Formatting tags in HTML, HTML5 Page layout and Navigation concepts, Semantic Elements in HTML, List, type of list tags, tables and form tags in HTML, multimedia basics, images, iframe, map tag, embedding audio and video clips on webpage.	**13hrs**
Unit 2	**Introduction to XML:** XML Syntax, XML Tree, Elements, Attributes, Namespace, Parser, XSLT DOM, DTD, and Schema. Introduction to CSS, CSS syntax, CSS selectors, CSS Background Cursor, CSS text fonts, CSS-List Tables, CSS Box Modeling, Display Positioning, Floats, CSS Gradients, Shadows, 2D and 3 Transform, Transitions, CSS Animations.	**13hrs**
Unit 3	**Introduction to JavaScript:** JavaScript Data type and Variables, JavaScript Operators, Conditional Statements, Looping Statements, JavaScript Functions, Number, Strings, Arrays, Objects in JavaScript, Window and Frame objects, Event Handling in JavaScript, Exception Handling, Form Object and DOM, JSON, Browser Object Model.	**13hrs**
Unit 4	**Introduction to Servlets:** Common Gateway Interface (CGI), Lifecycle of a Servlets, deploying a Servlets, The Servlets API, Reading Servlets parameters, reading initialization parameters, Handling HTTP Request & Responses, Using Cookies and sessions, connecting to a database using JDBC. **Web Security:** Authentication Techniques, Design Flaws in Authentication, Implementation Flaws in Authentication, Securing Authentication, Path Traversal Attacks. Injecting into Interpreted Contexts, SQL Injection, NoSQL Injection, XPath Injection, LDAP Injection, XML Injection, HTTP Injection, Mail Service Injection	**13hrs**

References	
1	Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dremtech
2	Java Server Pages – Hans Bergsten, SPD O'Reilly
3	Java Script, D.Flanagan, O'Reilly, SPD
4	Beginning Web Programming-Jon Duckett WROX.
5	Web Applications : Concepts and Real World Design, Knuckles, Wiley-India
6	Internet and World Wide Web – How to program, Dietel and Nieto, Pearson

DSC-7 Lab Course code: GMF 280P	Course Title: Web Technologies Lab
Total Contact Hours: 52	Hours/week : 04
Formative Assessment Marks: 25	Course Credits: 02
Exam Marks: 25	Duration of Exam: 03 Hours

Part A

- Design web pages for your college containing college name and Logo, departments list using href, list tags.
- Create a class timetable using table tag.
- Write a HTML code to design Student registrations form for your college Admission
- Design Web Pages with includes Multimedia data (Image, Audio, Video, GIFs etc)
- Create a web page using frame.
- Write code in HTML to develop a webpage having two frames that divide the webpage into two equal rows and then divide the row into equal columns fill each frame with a different background color.
- Write CSS code to Use Inline CSS to format your ID Card.
- Using HTML, CSS create display a text called —Hello India! || On top of an image of India-Map using an overlay.

Part B

- Write a JavaScript Program to perform Basic Arithmetic operations
- JavaScript Program to Check Prime Number
- JavaScript Program to implement JavaScript Object Concept
- JavaScript Program to Create Array and inserting Data into Array
- JavaScript Program to Validate an Email Address
- Write a Program for printing System Date & Time using SERVLET
- Write a serverside SERVLET program for accept number from HTML file and Display.
- Write a program to Creating the Life-Cycle Servlet Application

Evaluation Scheme for Lab Examination: Assessment Criteria	**Marks**
Writing 2 Programs	10
Execution of 1 Program	10
Viva and Record	05
Total	25

B.Sc.: Semester VI

DSC-8 Course code: GMF 290	Course Title: Statistical Computing & R Programming
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 40	Duration of SEE/Exam: $2^1/_2$ Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

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

- 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, Analyse, and Interpret Correlation Probability and Regression to analyse the underlying relationships between different variables

Unit	Contents	52hours
Unit 1	Introduction of the language, numeric, arithmetic, assignment, and vectors, Matrices and Arrays, Non-numeric Values, Lists and Data Frames, Special Values, Classes, and Coercion, Basic Plotting. Reading and writing files, Programming, Calling Functions, Conditions and Loops: stand-alone statement with illustrations in exercise 10.1, stacking statements, coding loops, Writing Functions, Exceptions, Timings, and Visibility.	**13hrs**
Unit 2	Statistics And Probability, basic data visualization, probability, common probability distributions: common probability mass functions, Bernoulli, binomial, Poisson distributions, common probability density functions, uniform, normal, student's t-distribution.	**13hrs**
Unit 3	Statistical testing and modelling, sampling distributions, hypothesis testing, components of hypothesis test, testing means, testing proportions, testing categorical variables, errors and power, Analysis of variance.	**13hrs**
Unit 4	Simple linear regression, multiple linear regression, linear model selection and diagnostics. Advanced graphics: plot customization, plotting regions and margins, point and click coordinate interaction, customizing traditional R plots, specialized text and label notation. Defining colors and plotting in higher dimensions, representing and using color, 3D scatterr plots.	**13hrs**

References	
1	Tilman M. Davies, ―The book of R: A first course in programming and ststistics‖, San Francisco, 2016.
2	Vishwas R. Pawgi, ―Statistical computing using R software‖, Nirali prakashan publisher, e1 edition, 2022.
3	https://www.youtube.com/watch?v=KlsYCECWEWE https://www.geeksforgeeks.org/r-tutorial/ https://www.tutorialspoint.com/r/index.htm

DSC-8 Lab Course code: GMF 290P	Course Title: R Programming Lab
Total Contact Hours: 52	Hours/week : 04
Formative Assessment Marks: 25	Course Credits: 02
Exam Marks: 25	Duration of Exam: 03 Hours

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 analyse the underlying relationships between different variables.

1. Write a R program for different types of data structures in R.
2. Write a R program that include variables, constants, data types.
3. Write a R program that include different operators, control structures, default values for arguments, returning complex objects.
4. Write a R program for quick sort implementation, binary search tree.
5. Write a R program for calculating cumulative sums, and products minima maxima and calculus.
6. Write a R program for finding stationary distribution of markanov chains.
7. Write a R program that include 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 a R program for with any dataset containing data frame objects, indexing and subsetting data frames, and employ manipulating and analysing data.
10. Write a program to create an any application of Linear Regression in multivariate context for predictive purpose.

Evaluation Scheme for Lab Examination: Assessment Criteria	**Marks**
Writing 2 Programs	10
Execution of 1 Program	10
Viva and Record	05
Total	25

Open Electives in Computer Science:
(For BA, BSc, BCom, BSW, BBA, BBM students studying Core Courses other than Computer Science/ Computer Applications)

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

DSC Specific Elective Courses:

Group 1:	**Group-2:**	**Group-3:**
• IoT • Cyber Law and Cyber Security • Web Programming - PHP and MySQL • Clouds, Grids, and Clusters • Software Testing	• Information and Network Security • Data Compression • Discrete Structures • Opensource Programming • Multimedia Computing • Big Data	• Data Analytics • Storage Area Networks • Pattern Recognition • Digital Image Processing • Parallel Programming • Digital Signal Processing

Question Paper Pattern: B.Sc.

Duration: $2^1/_2$ hours **Max. Marks: 60**

Part A

I. Answer any 10 questions out of 12 questions **10X2=20**

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

Part B

II. Answer the following questions **4X10=40**

13.
a.
or
b.
14.
a.
or
15.
a.
or
b.
16.
a.
or
b.