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	Discipline A1(4+2) Discipline B1(4+2)	OE-1 (3)	L1-1(3), L2-1(3) (4 hrs. each)	Environmental Studies (2)		Physical Education for fitness(1)(0+0+2)	Health & Wellness (1) (0+0+2)	25
II	Discipline A2(4+2) Discipline B2(4+2)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs. each)		SEC-1: Digital Fluency (2)(1+0+2)	Physical Education - Yoga(1) (0+0+2)	NCC/NSS/R&R(S&G) /Cultural (1) (0+0+2)	25
Exit option with Certificate (50 credits)								
III	Discipline A3(4+2) Discipline B3(4+2)	OE-3 (3)	L1-3(3), L2-3(3) (4 hrs. each)	Constitution of India (2)	2)	Physical Education-Sports (1) (0+0+2)	NCC/NSS/R&R(S&G) /Cultural (1)(0+0+2)	25
IV	Discipline A4(4+2) Discipline B4(4+2)	OE-4 (3)	L1-4(3), L2-4(3) (4 hrs. each)		SEC-2: Artificial Inte-lligence (2)(1+0+	Physical Education -Games (1) (0+0+2)	NCC/NSS/R&R(S&G) /Cultural (1)(0+0+2)	25
Exit option with Diploma (100 credits) or continue the third year with both the subjects as majors								
V	Discipline A5(3+2), Discipline A6(3+2) Discipline B5(3+2), Discipline B6(3+2)				SEC-3: SEC such as Cyber Security (2) (1+0+2)			23
VI	Discipline A7(3+2), Discipline A8(3+2) Discipline B7(3+2) Discipline B8(3+2) Internship (2)				SEC-4: Professional Communication(2)			24
Exit option with Bachelor of Arts, B.A./ Bachelor of Science, B. Sc. Basic Degree (146 credits) or Choose one of the Disciplines as Major								
VII	Discipline A/B-9(3+2) Discipline A/B-10(3+2) Discipline A/B-11(3)		DS-A/B Elective-1(3) DS-A/B Elective-2(3) Res.Methodology(3)					22
VIII	Discipline A/B-12(3+2) Discipline A/B-13(3) Discipline A/B-14(3)		DS-A/B Elective-3(3) Research Project (6)*					20

Model Curriculum Structure

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

Sem	Discipline Specific Core Courses (DSC)	Hour of Teaching/ Week		Discipline 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 Discipline Specific Elective Courses, Group – 1** DSE-2: Any one from Discipline 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 Discipline Specific Elective Courses, Group – 3** Research Project:	3 6

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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 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 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 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 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 Hours	100
		GME 290	Computer Networks	4	0	0	4	0	0	20	20	-	-	60	-	2 Hours	100
		GME 280P	PYTHON Programming lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
		GME 290P	Computer Networks Lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
	VI	GMF 280	Internet Technologies	4	0	0	4	0	0	20	20	-	-	60	-	2 Hours	100
		GMF 290	Operating System Concepts	4	0	0	4	0	0	20	20	-	-	60	-	2 Hours	100
		GMF 280P	JAVA Script, HTML, CSS	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50
		GMF 290P	C# Programming Lab	0	0	4	0	0	2	-	-	10	15	-	25	3 Hours	50

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	3	0	0	3	0	0	20	20	-	-	60	-	2 Hours	100

			Architecture														
		DSC-14	Data Warehousing and Data Mining	**3**	**0**	**0**	**3**	**0**	**0**	**20**	**20**	**-**	**-**	**60**	**-**	**2 Hours**	**100**
		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), Semesters I and II

B.Sc.: Semester: I

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: 02

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)

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

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: 02 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))

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**

Question Paper Pattern: B.Sc.

Duration: 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.