



MANGALORE UNIVERSITY

NATIONAL EDUCATION POLICY - 2020 (NEP-2020)

Curriculum Structures

for

Bachelor of Science

Basic and Honours Programmes

with

Computer Science as Major Course

Syllabus for I and II Semesters

and

Open Elective Courses in Computer Science

Board of Studies in Computer Science

Mangalore University

Konaje

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Preface

The members of the Board of Studies (BoS) in Computer Science are thankful to the Government of Karnataka for initiating the process of implementation of NEP-2020 and Authorities of the Mangalore University for implementing the concerned syllabus from the academic year 2021- 22 in Mangalore University. It is our privilege to be part of this process of finalizing syllabus of the Year B.Sc. (Basic/Honors) Degree Programme.

The respected members of the BoS conducted offline meeting on 21.10.2021 at 11am and subsequently by online meetings on 23.10.2021 at 6.00pm and 24.10.2021 at 6pm for discussion and finalizing the course titles as per model given in Table B2 Model Programme Structure for Bachelor of Science (Basic/Hons.) Programme (Subjects with practical)B2 Model Programme Structure for Bachelor of Science (Basic/Hons.) degree with Computer Science as one of Programme Core Subjects with Practical.

These deliberations also helped in framing the syllabi for I and II Semesters and also the Programme and Course outcomes. The model draft curriculum structure and the syllabi for the first two semesters of the Programme was presented in the BoS meeting and the inputs were considered during further revision. The model draft document is ready for submission to the University for further action.

The BoS is committed to frame the remaining part of the syllabus for the B.Sc. Programme and will be working further to fulfill all academic input requirements in implementing the curriculum in letter and spirit of NEP2020.

Model Programme Structure (B2) for Bachelor of Science (Basic/Honours) Programme (Subjects with Practical)

Sem.	Discipline Core (DSC) (Credits)	Discipline Elective (DSE) /Open Elective (OE) (Credits)	Ability Enhancement Compulsory Courses (AECC), Languages (Credits) (L+T+P)		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)		SEC-1: (2) (1+0+2)	Yoga (1)(0+0+2)	Health & Wellness (1) (0+0+2)	25
II	DSC A2(4+2) DSC B2(4+2)	OE-2 (3)	L1-2(3), L2-2(3) (4 hrs. each)	Environmental Studies (2)		Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1)(0+0+2)	25
Exit option with Certificate (48 credits)								
III	DSC A3(4+2) DSC B3(4+2)	OE-3 (3)	L1-3(3), L2-3(3) (4 hrs. each)		SEC-2: (2)(1+0+2)	Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (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)	Constitution of India (2)		Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	25
Exit option with Diploma in a particular Discipline (96 credits)								
V	DSC A5(3+2) DSC A6(3+2) DSC B5(3+2) DSC B6(3+2)				SEC-3: SEC (2) (1+0+2)	Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	24
VI	DSC A7(3+2) DSC A8(3+2) DSC B7(3+2) DSC B8(3+2)				SEC-4: Professional Communication (2)	Sports (1) (0+0+2)	NCC/NSS/R&R(S&G)/ Cultural (1) (0+0+2)	24
Exit with Bachelor of Degree in a particular Discipline (140 credits)								
VII	DSC A/B9(3+2) DSC A/B10(3+2) DSC A/B11(3)	DSC A/B E-1 (3) DSC A/B E-2 (3) Res. Methodology (3)						22
VIII	DSC A/B12(3) DSC A/B13(3) DSC A/B14(3)	DSC A/B E-3 (3) DSC A/B E-4 (3) Research Project (6)*						21
Award of Bachelor of Degree with Honours, B.Sc. (Hons.) (180 credits)								

***In lieu of the research Project, two additional elective papers/Internship may be offered.**

Curriculum Structure

Program: B.Sc. (Basic and Honors)

Subject: Computer Science

Sem	Discipline Specific Core Courses (DSC)	Hours/Week		Discipline Specific Elective Courses (DSE)/ Vocational Courses (VC)	Hours/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: Operating System Concepts DSC-5Lab: PYTHON Programming lab DSC-6Lab: Operating System lab	3 3	4 4	VC-1: Any one from Vocational Courses, Group – 1*	3
6	DSC-7: Internet Technologies DSC-8: Computer Networks DSC-7Lab: JAVA Script, HTML, CSS Lab DSC-8Lab: Computer Networks Lab	3 3	4 4	VC-2: Any one from Vocational Courses, Group – 2* Internship:	3 2
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	3 3 3		DSE-3: DSE-4: Any two from Discipline Specific Elective Courses, Group – 3 Research Project:	3 3 6

* Vocational Courses

Group-1

- DTP, CAD and Multimedia
- Hardware and Server Maintenance
- Web Content Management Systems
- E-Commerce
- Web Designing

Group-2

- Health Care Technologies
- Digital Marketing
- Office Automation
- Multimedia Processing
- Accounting Package

** Discipline Specific Elective Courses

Group-1

- IoT
- Cyber Law and Cyber Security
- Web Programming - PHP and MySQL
- Clouds, Grids, and Clusters
- SoftwareTesting

Group-2

- Information and Network Security
- Data Compression
- Discrete Structures
- Open source Programming
- Multimedia Computing
- Big Data

Group-3

- Data Analytics
- Storage Area Networks
- Pattern Recognition
- Digital Image Processing
- Parallel Programming
- Digital Signal Processing

First Semester

Course Code: DSC-1	Course Title: Computer Fundamentals and Programming in C
Course Credits: 4	Hours of Teaching/Week: 4
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 3 Hours

Course Outcomes (COs)

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

- 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	
<p>Fundamentals of Computers: Introduction to Computers –Definition of a computer, Characteristics of computers, Evolution of computers, Generations of computers, Classification of computers. Computer system, applications of computers.</p> <p>Number Systems – different types, conversion from one number system to another; Coding schemes –ASCII and Unicode.</p> <p>Computer Software – Categories of software.</p> <p>Computer Programming and Languages–Machine Level, Assembly level and Highlevel languages; Translator Programs – Assembler, Interpreter and Compiler. Developing a computer program, Program Development Cycle - Algorithm, Flowchart and Pseudocode with examples.</p> <p>Introduction to C Programming: Overview of C; History and Importance of C; Structure of a C Program with Examples; Creating and Executing a C Program; Compilation process in C.</p>	13
Unit - 2	
<p>C Programming Basic Concepts: C Character Set; C tokens - keywords, identifiers, constants, and variables; Data types; Declaration and initialization of variables; Symbolic constants.</p> <p>C Operators and Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Special operators; Operator Precedence and Associativity. Evaluation of arithmetic expressions; Type conversion.</p> <p>Input and output with C: Formatted I/O functions - <i>printf</i> and <i>scanf</i>, control stings and escape sequences, output specifications with <i>printf</i> functions; Unformatted I/O functions to read and display single character and a string - <i>getchar</i>, <i>putchar</i>, <i>gets</i> and <i>puts</i> functions.</p>	13

Unit - 3	
<p>Control Structures: Branching: if, if-else, nested if, else-if ladder, switch. Looping: while, do-while and for loop, nested loops, exit, break, jumps in loops.</p> <p>Arrays: One Dimensional arrays - Declaration, Initialization and Memory representation; Two Dimensional arrays - Declaration, Initialization and Memory representation.</p> <p>Strings: Declaring and Initializing string variables; String handling functions - <i>strlen</i>, <i>strcmp</i>, <i>strcpy</i> and <i>strcat</i>; Character handling functions - <i>tolower</i>, <i>toupper</i>, <i>isalpha</i>, <i>isnumeric</i> etc.</p>	13
Unit - 4	
<p>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.</p> <p>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.</p> <p>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.</p>	13

Text Books:

1. Pradeep K. Sinha and Priti Sinha: **Computer Fundamentals** (Sixth Edition), BPB Publication.
2. ITL Education Solution Limited, **Introduction to Information Technology**, Second Edition 2018, Pearson Education.
3. E. Balagurusamy: **Programming in ANSI C** (TMH), 7th Edition.

Reference Books :

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

Course Code: DSC-1 Lab	Course Title: C Programming Lab
Course Credits: 2	Hours of Teaching/Week: 4
Total Contact Hours: 52	Formative Assessment Marks: 20
Exam Marks: 30	Exam Duration: 3 Hours

Practice Lab

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

1. Basic Computer Proficiency
 - a) Familiarization of Computer Hardware.
 - 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. Program to read three numbers and find the biggest of three.
2. Program to find the area of a triangle using three sides of triangle.
3. Program to check for prime number.
4. Program to generate n Fibonacci numbers.
5. Program to read a multi - digit number find the sum of the digits, reverse the number and check it for palindrome.
6. Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers.
7. Program to accept student name and marks in three subjects. Find the total marks, average and grade (depending on the average marks).
8. Program to find the roots of quadratic equation(Demonstration of switchStatement).
9. Program to find largest and smallest element in a list of 'n' elements (Demonstration of one-dimensional array).
10. Program to multiply two matrices.

Part B

1. Program to accept 'n' and find the sum of the series $1! + 3! + 5! + \dots + n!$
2. Write user-defined functions to (a) find the length of a string (b) concatenate two strings. Call these functions in the main program.
3. Program to find whether a given string is palindrome or not (Use a function to reverse a string using pointers).
4. Program to transpose a matrix of order N x M and check whether it is symmetric or not.
5. Program to add two matrices using pointers.
6. Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.

7. Program to display the first 'n' Fibonacci numbers using a function to generate the nth Fibonacci number.
8. Program to find the GCD of 'n' integers using a function to compute the GCD of two integers.
9. Program to enter the information of n students (name, register number, marks in three subjects) into an array of structures. Compute and print the result of all students. For passing, student should get at least 35 in each subject, otherwise result is "FAIL".
If the student passes and if percentage ≥ 70 , result is DISTINCTION; If percentage is < 70 and ≥ 60 , result is FIRST CLASS; if percentage is < 60 and ≥ 50 , result is SECOND CLASS; otherwise result is PASS CLASS. Get the output of all students in a tabular form with proper column headings.
10. Program to prepare the pay slip of 'n' employees using an array of structures. Input the employee name, employee number and basic pay. Calculate the DA, HRA, PF, PT, Gross Pay and Net Pay as follows:
If Basic < 40000 , DA = 50% of Basic, HRA = 12% of Basic, PF = 12% of Gross Pay, PT = 250. Otherwise DA = 40% of Basic, HRA = 10% of Basic, PF = 13% of Gross, PT = 300.
Gross Pay = Basic + DA + HRA and Net Pay = Gross Pay – PF – PT.

Evaluation Scheme for Practical Examination

Assessment Criteria		Marks
Program-1 from Part A	Writing the Program	5
	Execution and Formatting	5
Program-2 from Part B	Writing the Program	7
	Execution and Formatting	8
Practical Records		5
Total		30

Course Code: CSOE1/CAOE1	Course Title: Office Automation
Course Credits: 3	Hours of Teaching/Week: 3
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 3 Hours

Course Outcomes (COs):

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

- Compare and contrast various types of operating systems
- Explain the purpose of office automation
- Describe how information is stored and retrieved in/from computer memory
- Know about various types of office automation software and their applications
- Create document using word processing software
- Design presentation using presentation software
- Create worksheets using spreadsheet software
- Store and retrieve data in/from database management application

Course Content

Content	Hours
Unit - 1	
<p>Computer software: Introduction, Software definition, Software categories, Installing and uninstalling software, Software piracy, Software terminologies</p> <p>Introduction to windows Operating System, operating with windows, GUI, use of help features, starting an application, essential accessories, creating shortcuts, windows explorer, control panel, finding folders and files, System utilities.</p> <p>MS-Office: Introduction, Office user interface, Microsoft office Components.</p> <p>MS-Word: Introduction, Starting MS-Word, Microsoft word Environment working with word documents, working with text, working with tables checking spelling and grammar, adding graphs to the document, mail merge, header and footers, page numbers, protect the document, working with formatting tools.</p>	12
Unit - 2	
<p>MS-Excel: Introduction, starting MS Excel, Microsoft Excel environment, Working with Excel workbook, Working with worksheet – Entering data, Excel formatting tips and Techniques, Generating graphs, Formulas and Functions, Inserting charts, Sorting, Pivot Tables, data extraction, adding clip art, add an image from a file, Printing in Excel.</p>	10
Unit - 3	
<p>MS-PowerPoint: Starting MS PowerPoint, Working with PowerPoint, Creating, Saving and Printing a presentation, Working with Animation, Adding a slide to presentation, Navigating through a presentation, Slide-sorter, Slide-show, Editing slides, Working with Graphics and Multimedia in PowerPoint (Inserting Photo, Video, and Audio).</p> <p>The Internet: Basic internet terms, Internet applications, Internet tools, Web browser, Web browser features, Internet Explorer environment, Electronic mail, Email address structure, Advantages and disadvantages of email.</p>	10

Unit - 4

Database Fundamentals - Basic database terms, Database Management System. MS-Access: Introduction to Access, Creating Tables and Database, Data Type and Properties, Adding & Deleting Field in Table, Primary Key Fields, Queries, Forms: The Forms wizard saving forms, Modifying forms, Pages, Macro, Module, Reports, Printing Report, Forms.	10
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Text Book :

1. ITL Education Solution Limited, Introduction to Information Technology, Second Edition., Pearson

Reference Books:

1. Peter Norton, Introduction to Computers, 7th edition, Tata McGraw Hill Publication, 2011)
2. Anita Goel, Computer Fundamentals, Pearson Education, 2011.
3. Linda Foulkes, Learn Microsoft Office 2019: A comprehensive guide to getting started with Word, PowerPoint, Excel, Access, and Outlook, Packet Publishing Limited, 2020.
4. Bittu Kumar, Mastering MS Office: Concise Handbook with Screenshots, V&S Publishers, 2017.

II Semester

Course Code: DSC-2	Course Title: Data Structures using C
Course Credits: 4	Hours of Teaching/Week: 4
Total Contact Hours: 52	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 3 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

Course Content

Content	Hours
Unit - 1	
Introduction to Data Structures: Definition, Need for Data Structures, Types of Data Structures. Linear Data Structures: Arrays - Definition, Declaration and storage of one- and two-dimensional arrays. Sparse matrices. Recursion: Definition; Types of recursion; Recursion Technique Examples - Fibonacci numbers, GCD, Binomial coefficient nC_r , Comparison between iterative and recursive functions. Sorting: Sorting – Selection sort, Bubble sort, Quick sort, Insertion sort; Comparison of different sorting techniques.	13
Unit - 2	
Searching: Introduction, Linear search, Binary Search, Comparison of different searching techniques. Dynamic memory allocation: Static and Dynamic memory allocation; Memory allocation and deallocation functions - <i>malloc</i> , <i>calloc</i> , <i>realloc</i> and <i>free</i> . Linked List: Introduction, characteristics, types of linked lists, Representation of singly linked list in memory, Singly linked list – Operations, algorithms, Representation of polynomials using linked lists. Circular linked list – Operations, Doubly linked list - operations. Memory allocations.	13
Unit - 3	
Stacks – Array representation of stacks, Linked representation of stacks, operations, Applications of stacks Recursion, Implementation of recursive procedure by stack (factorial function and Fibonacci sequence).	13

Arithmetic Expressions: Prefix, infix and postfix notation, infix to postfix conversion, evaluation of postfix expression.

Queues: Array representation of queue, Linked representation of queue, Types of queues- Simple queue, circular queue, double-ended queue, priority queue, operations on queues.

Unit - 4

Trees: Definition; Tree terminologies – node, root node, parent node, ancestors of a node, siblings, terminal and non-terminal nodes, degree of a node, level, edge, path, depth;

13

Binary tree: Types of binary trees - strict binary tree, complete binary tree, binary search tree. Array representation of binary tree. Traversal of binary tree; *preorder*, *inorder* and *postorder* traversal; Construction of a binary tree when inorder and pre/postorder traversals are given.

Graphs: Terminologies, Matrix representation of graphs, Traversals: Breadth First Search and Depth first search.

Text Books

1. Sartaj Sahni: Fundamentals of Data Structures.
2. YedidyahLang sam, Moshe J. Augenstein and Aaron M. Tenenbaum, **Data Structures Using C and C++**, 2nd Edition, PHI Publication
3. Seymour Lipschutz, Schaum's Outlines Series, **Data Structures with C**, Tata McGraw Hill 2011

References

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

Course Code: DSC-2 Lab

Course Title: Data Structures Lab

Course Credits: 2

Hours of Teaching/Week: 4

Total Contact Hours: 52

Formative Assessment Marks: 20

Exam Marks: 30

Exam Duration: 3 Hours

Programming Lab

Part A

1. Program to compute power of a number using a recursive function.
2. Program to compute the value of ${}^n C_r$ using a recursive function to find factorial function.
3. Program to implement dynamic array, find smallest and largest element of the array.
4. Program to read the names of cities and arrange them alphabetically.
5. Program to sort the given list using selection sort technique.
6. Program to sort the given list using bubble sort technique.
7. Program to sort the given list using quick sort technique.
8. Program to sort the given list using insertion sort technique.
9. Program to search an element using linear search technique.
10. Program to search an element using recursive binary search technique.

Part B

1. Program to implement queue using arrays.
2. Program to implement stack using arrays.
3. Program to implement stack using linked list.
4. Write a Program for converting an Infix Expression to Postfix Expression. Program should support both parenthesized and free parenthesized expressions with the following operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.
5. Program to evaluate a postfix expression.
6. Program to implement all operations on a sorted singly linked list.
7. Program to implement queue using linked list.
8. Program to implement circular queue using array.
9. Write a menu driven program for the following operations on Binary Search Tree (BST) of integers:
 - (a) Create a BST of 'n' Integers
 - (b) Traverse the BST in Inorder, Preorder and Postorder
 - (c) Search the BST for a given element and report the appropriate message
10. Program for the following operations on a graph (G) of cities:
 - (a) Create a graph of N cities using Adjacency Matrix.
 - (b) Print all the nodes reachable from a given starting node in a digraph using BFS method.

Evaluation Scheme for Practical Examination :

Assessment Criteria		Marks
Program-1 from Part A	Writing the Program	5
	Execution and Formatting	5
Program-2 from Part B	Writing the Program	7
	Execution and Formatting	8
Practical Records		5
Total		30

Course Code: CSOE2/CAOE2	Course Title: Web Designing
Course Credits: 3	Hours of Teaching/Week:
Total Contact Hours: 42	Formative Assessment Marks: 40
Exam Marks: 60	Exam Duration: 3 Hours

Course Outcomes (COs)

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

- Understand various Internet related terminologies
- Explain features and evolution of Internet
- Explain the use of search engines
- Know the use of different tags available in HTML
- Design web pages using HTML5, CSS3, XML and XHTML
- Implement websites using linked web pages.

Course Content

Content	Hours
Unit - 1	
<p>The Internet: Introduction, Evolution, basic internet terms, Getting connect to internet, Internet applications, Data over the internet.</p> <p>Internet tools: Web browser, Web browser features, Internet Explorer environment, Electronic mail, Email address structure, checking email, sending email, email attachment, How email works, advantages and disadvantages of email.</p> <p>Search Engines: Searching an internet, refining the search, Instant messaging, Features of messengers.</p>	12
Unit - 2	
<p>Overview of HTML5 -Exploring new features of HTML5, Structuring an HTML Document, Creating and saving HTML document, Viewing an HTML document.</p> <p>Fundamentals of HTML-Understanding Elements, Root elements, Metadata elements, Style element, Section element, Header and Footer element, Address element, Basic HTML data types, Data types defined by RFC and IANA Documentation.</p> <p>Working with Text: Formatting Text with HTML Elements, Defining MARK element, Defining STRONG element, Defining CODE element, Defining SMALL element.</p> <p>Organizing Text in HTML: Arranging text, Displaying Lists.</p>	10
Unit - 3	
<p>Working with Links and URLs- Exploring the Hyperlinks, Exploring the URL, Exploring Link Relations.</p> <p>Creating Tables-Understanding Tables, Describing the table element.</p> <p>Working with Images, Colors and Canvas - Inserting images in a web page, Exploring Colors, Introducing Canvas</p> <p>Working with Forms: Exploring Form element, Exploring types of the INPUT element, Exploring the BUTTON element, Exploring the Multiple-Choice elements, Exploring TEXTAREA and LABEL elements.</p>	10

Working with Frames: <FRAMESET>, <FRAME> tag with attributes.	
Unit - 4	
Overview of CSS3- Understanding the syntax of CSS, Exploring CSS Selectors, Inserting CSS in an HTML document.	10
Background and Color Gradients in CSS: Exploring Background of a Web Page, Exploring Color Properties, Exploring Gradient Properties, Exploring Font properties.	
Working with Basics of XML- Exploring XML, Comparing XML with HTML, Describing the Structure of an XML document.	

Text Books:

1. ITL Education Solution Limited, Introduction to Information Technology, Pearson Education, 2012
2. DT Editorial Services, HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), Second Edition, Dreamtech Publisher, 2016

References :

1. Laura Lemay & Rafe Colburn, Mastering Html, CSS & JavaScript, Web Publishing, 2016
2. Firuza Aibara, HTML 5 for Beginners, 2012
3. Glenn Johnson, Training Guide – Programming in HTML5 with JavaScript and CSS3 (Microsoft Press Training Guide), 2013

Scheme of Assessment for Theory Examination

Question Pattern		Marks
Part – A		
1. Answer any SIX sub-questions (6×2=12)		12
Sub-question	Unit	
a, b	1	
c, d	2	
e, f	3	
g, h	4	
Part – B (Answer any ONE full question from each unit – 12 marks each) (Combinations of sub-questions of 3 to 6 marks)		
Unit-1		12
2.		
3.		
Unit-2		12
4.		
5.		
Unit-3		12
6.		
7.		
Unit-4		12
8.		
9.		
Total		60

MANGALORE UNIVERSITY



National Education Policy – 2020 [NEP-2020]

Curriculum Structure:
**B.Sc. Basic and Honors Degree Syllabus for III and IV
semesters**
And
Open Elective Courses in Computer Science

CURRICULUM STRUCTURE

Program: BSc (Basic and Honors)

Subject: Computer Science

1. Computer Science as MAJOR with another Subject as MINOR (Table IIA of Model Curriculum)
2. Computer Science as MAJOR with another Subject also as MAJOR (Table IIIA of Model Curriculum)
3. Computer Science as MINOR with another Subject as MAJOR (As per Table IIA of Model Curriculum)

Sem.	Discipline Specific Core Courses (DSC)	Hour / Week		DS Elective Courses	Hours/ Week
		Theory	Lab		
III	DSC-3: Object Oriented Programming Concepts and Programming in JAVA	4			
	DSC-3 Lab: JAVA Lab		4		
IV	DSC-4: Database Management Systems	4			
	DSC-4 Lab: DBMS Lab		4		

Syllabus for BSc (Basic and Honors), Semesters III and IV

Semester: III

Course Title: Object Oriented Programming Concepts and Programming in Java	Course code: DSC3
Total Contact Hours: 52	Course Credits: 04+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

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

- Understand the object-oriented concepts and JAVA Technology.
- Java technology enabled solutions for various applications
- Understand the Java features to implement concurrency, parallelism etc.
- Demonstrate the basic principles of creating Java applications with GUI.

SYLLABUS

DSC3: Object Oriented Programming Concepts and Programming in Java

Contents	Hours
Unit-1	
Introduction to Java: Basics features of Java programming, Java program structure, Java Virtual Machine, Constants, Variables, Data Types, Operators, Control structures: if , if ...else , else if ladder, switch statements Looping Structures: for, while, do...while, for-each	13
Unit-2	
Objects and Classes: Basics of objects and classes, Methods and objects, Constructors, Method Overloading, Finalizer, Visibility modifiers, Arrays in Java, built-in classes: Math, String, Character, String Buffer and their methods. this reference. Inheritance and Polymorphism: Inheritance, Super and Sub class, Overriding, Polymorphism, Dynamic binding, Casting objects, Abstract methods and Classes, Interfaces, Packages, Built-in packages: io, util, lang, awt.	13
Unit-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: Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Menus, Dialog Box. Applet and its life cycle, Introduction to Swing, Exceptional Handling Methods	13
Unit-4	
I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files. Multithreading in Java: Thread life cycle and methods, Runnable interface, Thread synchronization. Introduction to Network Programming : Network Basics and Remote Method Invocation (RMI) Java Database Connectivity: JDBC Driver Types, JDBC Packages, Overview of the JDBC process, Database Connection.	13

Text Books:

1. Programming with Java, By E Balagurusamy – A Primer, 4th Edition, McGraw Hill Publication.

Reference Books:

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, 1st Edition, PHI Learning 2017.
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.

Semester: IV

Course Title: Database Management System	Course code: DSC4
Total Contact Hours: 52	Course Credits: 04+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 02 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

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

- Understand the various database concepts and the need for database systems.
- Identify and define database objects, enforce integrity constraints on a database using different modeling techniques
- Design a data model and Schemas in RDBMS.
- Identify entities and relationships and draw ER diagram for a given real-world applications.
- Realization of ER models through Relational Model using SQL
- Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- Understand the transaction processing and concurrency control techniques.

DSC7: Database Management System (DBMS)

Contents	Hours
Unit-1	
<p>Database Architecture: Introduction to Database systems, Applications, Characteristics, Database users, Data models, Database schema, Database architecture, Data independence, Database languages, Classification of DBMS.</p> <p>E-R Model: Entity-Relationship modeling: E-R Model Concepts, Entity, Entity types, Entity sets, Attributes, Types of attributes, Relationships between the entities. Relationship types, Roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity, E-R diagram</p>	13
Unit-2	
<p>Relational Data Model: Relational model concepts, Characteristics of relations.</p> <p>Relational model constraints: Domain constraints, Key Constraints, Primary & Foreign Key Constraints, Integrity Constraints, and Null Values.</p> <p>Data Normalization: Functional dependencies, Normalization, First normal form, Second normal form, Third normal form, Boyce-Codd normal form.</p> <p>Transaction Management: Introduction to Transaction Processing, Single user & multiuser systems, Transaction states, Transaction Properties, Transactions: read & write operations, Need of concurrency control, The lost update problem, Dirty read problem, Types of failures.</p>	13
Unit-3	
<p>INTERACTIVE SQL: Table fundamentals, Oracle data types, Create Table command, Inserting data into table, Viewing Data in the table, sorting data in a table, Creating a table from a table, Inserting data into a table from another table, Delete operations, Updating the contents of a table, Modifying the structure of tables, Renaming tables, destroying tables, displaying table structure.</p> <p>DATA CONSTRAINTS: Types of data constraints, IO constraints-The PRIMARY KEY constraint, The FOREIGN KEY constraint, The UNIQUE KEY constraint, Business Rule Constraints, NULL value concepts, NOT NULL constraints, CHECK constraint, DEFAULT VALUE concepts.</p> <p>OPERATIONS ON TABLE DATA: Arithmetic Operators, Logical Operators, Range Searching, Pattern Matching, Oracle Table – DUAL, Oracle Function-Types, Aggregate Function, Date Conversion Function. GROUPING DATA FROM TABLES IN SQL, Group By Clause, Having Cause, Subqueries, JOINS, UNION, INTERSECTION, MINUS Clauses</p>	13
Unit-4	
<p>INTRODUCTION TO PL/SQL: The Generic PL/SQL Block, PL/SQL: The character set, Literals, PL/SQL data types, Variables, Logical comparisons, Displaying User Messages on The VDU Screen, Comments. Control Structures - Conditional Control, Iterative Control</p> <p>PL/SQL Transactions: Cursors-Types of Cursors, Cursor Attributes. Explicit cursor- Explicit cursor Management, Cursor for loop</p> <p>PL/SQL Database Objects: Procedures and Functions, Oracle Packages, Error Handling in PL/SQL.</p>	13

Text Books:

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

Reference Books:

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

Skill Enhancement Course: SEC for other Programmes

Semester: III

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

Course Outcomes (COs):

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

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

Course Contents:

Contents	Hours
Unit-1	
<p>Overview of AI: Definition of Artificial Intelligence, Philosophy of AI, Goals of AI, Elements of AI system, Programming a computer without and with AI, AI Techniques, History of AI.</p> <p>Intelligent Systems: Definition and understanding of Intelligence, Types of Intelligence, Human Intelligence vs Machine Intelligence.</p>	05
Unit-2	
<p>AI Applications: Virtual assistance, Travel and Navigation, Education and Healthcare, Optical Character Recognition, E-commerce and Mobile Payment Systems, Image based Search and Photo Editing.</p> <p>AI Examples in daily life: Installation of AI apps and instructions to use AI apps.</p>	05
Unit-3	
<p>Robotics: Introduction to Robotics, Difference in Robot System and Other AI Program, Components of a Robot.</p>	03

<p>Laboratory Activities:</p> <ul style="list-style-type: none"> • Amazon Alexa: https://play.google.com/store/apps/details?id=com.amazon.dee.app&hl=en&am p:gl=US • Google Lens: https://play.google.com/store/search?q=google+lens&c=apps&hl=en&gl=US • Image to Text to Speech ML OCR: https://play.google.com/store/apps/details?id=com.mlscanner.image.text.sp eech&hl=en_IN&gl=US • Google Pay: https://play.google.com/store/apps/details?id=com.google.android.apps.nbu .paisa.user&hl=en_IN&gl=US • Grammarly: https://play.google.com/store/search?q=grammarly&c=apps&hl=en_IN&gl= • Google Map: https://play.google.com/store/search?q=google+maps&c=apps&hl=en&gl=U S • FaceApp: https://play.google.com/store/apps/details?id=io.faceapp&hl=en_IN&gl=US • Socratic: https://play.google.com/store/apps/details?id=com.google.socratic&hl=en_I N&gl=US • Google Fit: Activity Tracking: https://play.google.com/store/apps/details?id=com.google.android.apps.fitne ss&hl=en_IN&gl=US • SwiftKey Keyboard: https://swiftkey-keyboard.en.uptodown.com/android • E-commerce App: https://play.google.com/store/apps/details?id=com.jpl.jiomart&hl=en_IN&gl= US 	26
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Text Books:

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

Reference Books:

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

Reference Links:

1. Voice Assistant: <https://alan.app/blog/voiceassistant-2/>
2. Browse with image: <https://www.pocket-lint.com/apps/news/google/141075-what-is-google-lens-and-how-does-it-work-and-which-devices-have-it>
3. OCR: <https://aws.amazon.com/what-is/ocr/>
4. Mobile Payment system: <https://gocardless.com/en-us/guides/posts/how-do-mobilepayment-systems-work/>
5. Grammarly: <https://techjury.net/blog/how-to-use-grammarly/#gref>
6. Travel & Navigation: <https://blog.google/products/maps/google-maps-101-ai-powernew-features-io-2021/>
7. AI in photo editing: <https://digital-photography-school.com/artificial-intelligencechanged-photo-editing/>
8. AI in education: <https://www.makeuseof.com/what-is-google-socratic-how-does-itwork/>
9. AI in health and fitness: <https://cubettech.com/resources/blog/implementing-machinelearning-and-ai-in-health-and-fitness/>
10. E-commerce and online shopping: <https://medium.com/@nyxonedigital/importanceof-e-commerce-and-online-shopping-and-why-to-sell-online-5a3fd8e6f416>

Question Paper Pattern for Skill Enhancement Course

Artificial Intelligence

Duration: 1 Hour

Max. Marks: 30

Part-A

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

Unit-1:

- 1.
- 2.
- 3.
- 4.

Unit-2:

- 5.
- 6.
- 7.
- 8.

Unit-3:

- 9.
- 10.
- 11.
- 12.

Part-B

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

Unit-1:

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

Unit-2:

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

Unit-3:

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

Open Elective for III Semester: Programming in C

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

Course Outcomes (COs):

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

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

Course Contents:

Contents	Hours
Unit-1	
<p>Overview of C: Importance of C Program, Basic structure of a C-program, Execution of a C Program.</p> <p>C Programming Basic Concepts: Character set, Tokens, Keywords, Constants, Symbolic constants, Variables, Data types,</p> <p>Input and output with C: Formatted I/O functions – <i>printf</i> and <i>scanf</i>, control strings and escape sequences, output specifications with <i>printf</i> functions; Unformatted I/O functions to read and display single character and a string-<i>getchar</i>, <i>putchar</i>, <i>gets</i> and <i>puts</i> functions.</p>	11
Unit-2	
<p>Operators & Expressions: Arithmetic operators; Relational operators; Logical operators; Assignment operators; Increment & Decrement operators; Bitwise operators; Conditional operator; Operator Precedence and Associativity; Evaluation of arithmetic expressions;</p> <p>Control Structures: Decision Making and Branching -Decision making with if statement, simple if statement, the if else statement, nesting of if...else statements, the else if ladder, the switch statement, ?: operator, the go to statement.</p>	11

Unit-3	
<p>Looping Structures: Decision making and looping - The while statement, the do statement, for statement, nested loops, exit, break, Jumps in loops.</p> <p>Derived data types in C: Arrays-declaration, initialization and access of one-dimensional and two-dimensional arrays.</p>	10
Unit -4	
<p>Handling of Strings: Declaring and initializing string variables, reading strings from terminal, writing strings to screen, String handling functions - <i>strlen, strcmp, strcpy, strstr and strcat</i>; Character handling functions - <i>toascii, toupper, tolower, isalpha, isnumeric</i>.</p> <p>Functions: Basics of functions, Parameter Passing, Simple functions</p> <p>File handling: Basics of file programming concepts- <i>fprintf</i> and <i>fscanf</i>, and example programs</p>	10

Text Book:

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

Reference Books:

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

Open Elective for III Semester: R Programming

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

Course Outcomes (COs):

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

Course Contents:

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

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

Text Book:

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

Reference Books:

2. Seema Acharya, Data Analytics using R, McGrawHill Education (India), 2018, ISBN: 978-93-5260-524-8.
3. Tutorials Point (I) simply easy learning, Online Tutorial Library (2018), R Programming, Retrieved from https://www.tutorialspoint.com/r/r_tutorial.pdf.
4. Andrie de Vries, JorisMeys, R for Dummies A Wiley Brand, 2nd Edition, John Wiley and Sons, Inc, 2015, ISBN: 978-1-119-05580-8.

Open Elective for IV Semester: Python Programming Concepts

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

Course Outcomes (COs):

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

Course contents:

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

Text Book:

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

Reference Books:

1. Learning with Python, Allen Downey, Jeffrey Elkner, Chris Meyers, 2015
(Freely available online 2015.
@<https://www.greenteapress.com/thinkpython/thinkCSpy.pdf>)
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. <http://www.ibiblio.org/g2swap/byteofpython/read/>
4. http://scipy-lectures.org/intro/language/python_language.html
5. <https://docs.python.org/3/tutorial/index.html>

Open Elective for IV Semester: E-COMMERCE

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

Course Outcomes (COs):

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

Course Contents:

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

Text Book:

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

Reference Books:

1. <http://docs.opencart.com/>
2. <http://devdocs.magento.com/>
3. <http://doc.prestashop.com/display/PS15/Developer+tutorials>
4. Robbert Ravensbergen, —Building E-Commerce Solutions with WooCommerce, PACKT, 2nd Edition.

MANGALORE UNIVERSITY



**National Education Policy – 2020
[NEP-2020]**

CURRICULUM STRUCTURE

FOR

**V AND VI SEMESTER B.Sc.
COMPUTER SCIENCE**

Model Curriculum for B.Sc

Semester	Course No	Theory/Practical	Credits	Paper Title	S.A	L.A
V	DSC5	Theory	4	Programming in Python	60	40
	DSC5-Lab	Practical	2	Python Programming Lab	25	25
	DSC6	Theory	4	Computer Networks	60	40
	DSC6-Lab	Practical	2	Computer Networks Lab	25	25
	SEC-4	Theory	3	Employability skills	60	40
VI	DSC8	Theory	4	Web Technologies	60	40
	DSC8-Lab	Practical	2	Web Technologies Lab - Java Script, HTMS, CSS Lab	25	25
	DSC9	Theory	4	Statistical Computing & R Programming	60	40
	DSC9-Lab	Practical	2	R Programming Lab	25	25
	SEC-5	Theory/Practical	2	Internship	30	20

V SEMESTER

Program Name	B.Sc	Semester	V
Course Title	Programming in Python (Theory)		
Course Code:	DSC5	No.of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs):

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

- Setup python to develop simple applications
- Understand the basic concepts in Python Programming
- Learn how to write, debug and execute Python programs
- Understand and demonstrate the use of advanced data types such as tuples, dictionaries and lists, Tuples and Sets
- Design solutions for problems using object-oriented concepts in Python
- Use and apply the different Python Libraries for GUI Interface, Data Analysis and Data Visualization.
- Extend the knowledge of python programming to build successful career in software development.

Unit	Description	Hours
1	<p>Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program.</p> <p>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.</p> <p>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.</p> <p>Exception Handling: Types of Errors; Exceptions; Exception Handling using try, except and finally.</p> <p>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</p>	13

2	<p>Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifies; Escape Sequences; Raw and Unicode Strings; Python String Methods.</p> <p>Lists: Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists.</p> <p>Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries.</p> <p>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.</p>	13
3	<p>File Handling: File Types; Operations on Files- Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator.</p> <p>Object Oriented Programming: Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, Private Instance Variables; Polymorphism- Definition, Operator Overloading.</p> <p>GU Interface: The tkinter Module; Window and Widgets; Layout Management- pack, grid and place</p>	13
4	<p>Python SQLite: The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables Insert, Select, Update. Delete and Drop Records.</p> <p>Data Analysis: NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames.</p> <p>Data Visualisation: Introduction to Data Visualisation; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart</p>	13
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019. 2. R. Nageswara Rao, "Core Python Programming", Dreamtech. <p>References:</p>		

Program Name	B.Sc	Semester	V
Course Title	Python Programming Lab (Practical)		
Course Code:	DSC5-Lab	No.of Credits	02
Contact hours	04 Hours	Duration of SEA/Exam	3 hour
Formative Assessment Marks	25 Marks	Summative Assessment Marks	25 Marks

Evaluation Scheme for Lab Examination:

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

Program Name	B.Sc	Semester	V
Course Title	Computer Networks (Theory)		
Course Code:	DSC6	No.of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	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 CO6 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.
- Analyze and interpret various Data Link Layer and Transport Layer protocols.
- Explain different application

Unit	Description	Hours
1	<p>Introduction: Uses of Computer Networks and its Applications- Business Applications, Home Applications, Mobile Users, Social Issues.</p> <p>Network Topologies: Bus, Star, Ring</p> <p>Network Hardware- Local Area Networks, Metropolitan Area Networks, Wide Area Networks, and Internetworks.</p> <p>Reference Models- The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP Reference Models.</p>	13
2	<p>The Physical Layer: Transmission Media- Twisted Pair, Coaxial Cable and Fiber Optics.</p> <p>Wireless Transmission- Radio Transmission, Microwave Transmission, Infrared, Light Transmission. Multiplexing- Frequency division, time division, code division, Switching.</p> <p>The Data Link Layer: Data link layer design issues- Services Provided to the Network Layer, Framing, Error Control, and Flow Control. Error Detection and Correction- Error-Correcting Codes, Error -Detecting Codes. Elementary Data Link Protocols- An Unrestricted Simplex Protocol, A Simplex Stop-and-Wait Protocol for an Error-Free Channel, A Simplex Protocol for a Noisy Channel. Sliding Window Protocols -A One Bit Sliding Window Protocol, A Protocol Using Go back n, A Protocol using Selective Repeat.</p>	13

3	<p>The Network Layer: Network layer design issues-Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual Circuit and Datagram Networks. Routing Algorithms-Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Anycast Routing. Congestion Control Algorithms- Approaches to Congestion Control, Approaches to Congestion Control, Admission Control. The network layer in the Internet-The IP Version 4 Protocol, IP Address, IP Version 6, Internet Control Protocol, The Interior Gateway Routing Protocol: OSPF, The Exterior Gateway Routing Protocol: BGP.</p>	13
4	<p>The Transport Layer: The Transport Service-Services Provided to the Upper Layers. Elements of Transport Protocols-Addressing, Connection Establishment, connection Release, Error control and Flow Control. The Internet Transport Protocols-(TCP and UDP)-UDP- Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols, TCP- Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Sliding Window,</p> <p>The Application Layer: DNS – Domain Name System-The DNS Name Space, Domain Resource Records, Name Servers. Electronic Mail-Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, The World Wide Web- Architectural Overview, Static Web Pages, Dynamic Web Pages and Web Applications, HTTP-The HyperText Transfer Protocol</p>	13
<p>Text Book</p> <ol style="list-style-type: none"> 1. Computer Networks, Andrew S. Tanenbaum, 5th Edition, Pearson Education, 2010. <p>References:</p> <ol style="list-style-type: none"> 1. Data Communication & Networking, Behrouza A Forouzan, 3rd Edition, Tata McGraw Hill, 2001. 2. Data and Computer Communications, William Stallings, 10th Edition, Pearson Education, 2017. 3. Data Communication and Computer Networks, Brijendra Singh, 3rd Edition, PHI, 2012. 4. Data Communication & Network, Dr. Prasad, Wiley Dreamtech. 5. http://highered.mheducation.com/sites/0072967757/index.htmls 		

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

Program Name	B.Sc.	Semester	V
Course Title	Computer Networks Laboratory (Practical)		
Course Code:	DSC6 Lab	No.of Credits	02
Contact hours	04 Hours per week	Duration of SEA/Exam	3 hours
Formative Assessment Marks	25	Summative Assessment Marks	25

PART-A-Network Simulation using NS simulator

PART-B-Implementation of networking algorithm using JAVA.

Evaluation Scheme for Lab Examination:

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

Links for open source simulation software:

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

Links for open source simulation software:

<https://www.nsnam.com/2018/06/installation-of-ns2-in-ubuntu-1804.html#:~:text=Unlike%20earlier%20version%20of%20ubuntu,then%20ns2%20and%20then%20configuration>

<https://www.howtoinstall.me/ubuntu/18-04/nam/>

Program Name	BSC	Semester	V
Course Title	Employability skills (Theory)		
Course Code:	SEC-5	No.of Credits	03
Contact hours	48 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Program Name	B.Sc.	Semester	VI
Course Title	Web Technologies (Theory)		
Course Code:	DSC8	No.of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs):

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

- CO1. Understand basics of web technology
- CO2. Recognize the different Client-side Technologies and tools like, HTML, CSS, JavaScript
- CO3. Learn Java Servlets and JDBC
- CO4. Web Technology for Mobiles and Understand web security

Unit	Description	Hours
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.	13
2	Introduction to XML: XML Syntax, XML Tree, Elements, Attributes, Namespace, Parser, XSLT DOM, DTD, 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.	13
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.	13
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	13

Program Name	B.Sc.	Semester	VI
Course Title	Statistical Computing & R Programming(Theory)		
Course Code:	DSC9	No.of Credits	04
Contact hours	52 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Outcomes (COs):

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

- CO1. Explore fundamentals of statistical analysis in R environment.
- CO2. Describe key terminologies, concepts and techniques employed in Statistical Analysis.
- CO3. Define Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems.
- CO4. Conduct and interpret a variety of Hypothesis Tests to aid Decision Making.
- CO5. Understand, Analyse, and Interpret Correlation Probability and Regression to analyse the underlying relationships between different variables.

Unit	Description	Hours
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.	13
2	Reading and writing files, Programming, Calling Functions, Conditions and Loops: stand- alone statement with illustrations in exercise, stacking statements, coding loops, Writing Functions, Exceptions, Timings, and Visibility. Basic Data Visualization.	13
3	Descriptive Statistics: Types of Data, Nominal, Ordinal, Scale and Ratio, Measures of Central Tendency, Mean, Mode and Median, Percentiles, Quartiles, Measures of Variability, Mean Absolute Deviation Range, Inter-Quartile-Range, Standard Deviation, Z-Scores. Coefficient of Variation, Measure of shape- Skewness and Kurtosis, Bar Chart, Pie Chart and Box Plot, Histogram, Frequency Polygon, Stem and Leaf Diagram. Probability, Probability and Sampling Distribution: Methods of assigning probability, Structure of probability, Marginal, union, joint and conditional probabilities. Discrete Probability Distributions: Binomial, Poisson, Continuous Probability Distribution, Normal Distribution, Uniform Distribution. Estimating the population mean using the and t-distribution.	13

Program Name	B.Sc.	Semester	VI
Course Title	Web Technologies Lab		
Course Code:	DSC8-Lab	No.of Credits	02
Contact hours	04 Hours per week	Duration of SEA/Exam	3 hours
Formative Assessment Marks	25	Summative Assessment Marks	25

Evaluation Scheme for Lab Examination:

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

Program Name	B.Sc.	Semester	VI
Course Title	R Programming Lab		
Course Code:	DSC9-Lab	No.of Credits	02
Contact hours	04 Hours per week	Duration of SEA/Exam	3 hours
Formative Assessment Marks	25	Summative Assessment Marks	25

Evaluation Scheme for Lab Examination:

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

Program Name	B.Sc	Semester	VI
Course Title	Internship		
Course Code:	SEC-5	No.of Credits	02
Contact hours	30 Hours	Duration of SEA/Exam	2 hours
Formative Assessment Marks	20	Summative Assessment Marks	30

GUIDELINES FOR CONDUCTING INTERNSHIP:

Internships can cover a wide range of concepts and topics and some common concepts that can be covered under various types of internships:

- **Technical Skills**

- Depending on the field, interns can develop technical skills such as programming languages, software tools, data analysis, design software, and more.

- **Soft Skills:**

- **Communication:** Written and verbal communication skills, including effective email communication, presentations, and client interactions.
- **Teamwork:** Collaborating with colleagues, working in cross-functional teams, and building effective relationships.
- **Time Management:** Prioritizing tasks, managing deadlines, and staying organized.
- **Problem Solving:** Analyzing challenges, identifying solutions, and making informed decisions.

- Adaptability: Handling changes, learning new processes, and adjusting to evolving situations.
- **Innovation and Entrepreneurship:**
 - Exploring innovative business ideas, product development, market research, and business model creation.
- **Data Analytics and Interpretation:**
 - Learning how to work with data, perform analysis, and derive insights to inform decision-making.
- **Leadership and Management:**
 - Developing leadership skills, understanding different management styles, and learning how to motivate teams.

These are just a few examples of the many concepts that can be covered in internship programs. The specific concepts/coverage of the above will vary based on college infrastructure and faculty competence. It is important to tailor the internship experience to align with the interns' career goals and the industry needs.

Evaluation:

The report shall be prepared by the student under the guidance of the identified mentor in the college and submitted to the Head of the Department for evaluation. The report shall be evaluated by the two internal faculty members and submit the final sessional and summative marks to the university.