UG PROGRAM (4 Years Honors)

CBCS-2020-21

B.Sc.
Computer Science

Syllabus and Model Question Papers

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Note: BOS is to provide final soft copy in PDF and word formats and four copies of hard copies in bounded form to the office of Dean Academic affairs.

RESOLUTIONS OF THE BOARD OF STUDIES

Meeting held on: 22.01.2021.Time:10 A.MAt: Adikavi Nannaya University, RJY

Agenda:

1. Adoption of revised-common program structure and revising/updating course - wise syllabi (in the prescribed format) as per the guidelines issued by APSCHE.
2. Adoption of regulations on scheme of examination and marks/grading system of the University UG programs.
3. Preparation of Model question papers in prescribed format.
4. List of equipment/software requirement for each lab/practical
5. Eligibility of student for joining the course
6. Eligibility of faculty for teaching the course
7. List of paper-setters/paper evaluators with phone, email-id in the prescribed format

Members present:

Dr. P.Venkateshwara Rao	Chairman, Dept. of CSE, ANUR.
Sri.D.V.S.Suryanarayana	Member, MVNJS & RVRCollege of A&S, Malkipuram
Mr.D.Dasu	Coordinator, Dept. of CSE,ANUR

Resolutions:

2. Resolved to adopt the revised-common program structure and revising/updating course-wise syllabi (in the prescribed format) as per the guidelines issued by APSCHE.
3. Resolved to adopt the regulations on scheme of examination and marks/gradingsystem of the University UG programs.
4. Resolved to prepare the Model question papers in prescribed format.
5. Resolved to give the list of equipment/software requirement for each lab/practical
6. Resolved the eligibility of student for joining the course
7. Resolved the eligibility of faculty for teaching the course
8. Resolved to give the list of paper-setters/paper evaluators with phone, email-id in the prescribed format

UG Program (4 years Honors) Structure (CBCS)

2020-21 A. Y., onwards

BACHLOR OF SCIENCE

(3rd and 4th year detailed design will be followed as per APSCHE GUIDELINES)

Subjects/ Semesters		I		II		III		IV		V		VI			
		H/W	C	H/W	C	H/W	C	H/W	C	H/W	C	H/W	C		
Languages															
English		4	3	4	3	4	3								
Language (H/T/S)		4	3	4	3	4	3								
Life Skill Courses		2	2	2	2	2+2	2+2								
Skill Development Courses		2	2	2+2	2+2	2	2								
Core Papers															
M-1	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-2	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-3	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-1	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-2	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-3	SEC (C6,C7)									4+2 4+2	4+1 4+1				
Hrs/ W (Academic Credits)		30	25	32	27	32	27	36	30	36	30	0	12	4	4
Project Work															
Extension Activities (Non Academic Credits)															
NCC/NSS/Sports/Extra Curricular								2							
Yoga						1		1							
Extra Credits															
Hrs/W (Total Credits)		30	25	32	27	32	28	36	33	36	30	0	12	4	4

Note on columns VI and right-most sections:
- VI column relates to: THIRD PHASE of APPRENTICESHIP Entire 5th / 6th Semester
- Right-most section: FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations).

M= Major; C= Core; SEC: Skill Enhancement Courses

Marks & Credits distribution: UG-Sciences

Sl. No	Course type	No. of courses	Each course teaching Hrs/wk	Credit for each course	Total credits	Each course evaluation			Total marks
						Conti-Assess	Univ-exam	Total	
1	English	3	4	3	9	25	75	100	300
2	S.Lang	3	4	3	9	25	75	100	300
3	LS	4	2	2	8	0	50	50	200
4	SD	4	2	2	8	0	50	50	200
5	Core/SE -I	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -II	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -III	5+2	4+2	4+1	35	25	75+50	150	1050
6	Summer-Intern	2		4	8		100	200	200
7	Internship/ Apprentice/ on the job training	1		12	12		200	200	200
		38			**159**				**4550**
8	**Extension Activities (Non Academic Credits)**								
	NCC/NSS/Sports/ Extra Curricular			2	2				
	Yoga	2		1	2				
	Extra Credits								
	Total	**40**			**142**				

DETAILS OF PAPER TITLES & CREDITS

Sem	Course no.	Course Name	Course type (T/L/ P)	Hrs/Week Science: 4+2	Credits Science: 4+1	Max. Marks Cont/ Internal /Mid Assessment	Max. Marks Sem- end Exam
I	1	Problem Solvingin C	T	4	4	25	75
		Problem Solving in CLab	L	2	1	-	50
II	2	Data Structures using C	T	4	4	25	75
		Data Structures using C Lab	L	2	1	-	50
III	3	Database ManagementSystem	T	4	4	25	75
		Database Management System Lab	L	2	1	-	50
IV	4	Object Oriented Programming using Java	T	4	4	25	75
		Object OrientedProgramming using Java Lab	L	2	1	-	50
	5	Operating Systems	T	4	4	25	75
		Operating Systems Lab using C/Java	L	2	1	-	50
V	6A	Web InterfaceDesigning Technologies	T	4	4	25	75
		Web Interface Designing Technologies Lab	L	2	1	-	50
	7A	Web Applications Development using PHP& MYSQL	T	4	4	25	75
		Web Applications Development using PHP & MYSQL Lab	L	2	1	-	50
		OR					
	6B	Internet of Things	T	4	4	25	75
		Internet of Things Lab	L	2	1	-	50
	7B	Application Development using Python	T	4	4	25	75
		Application Development Using Python Lab	L	2	1	-	50
		OR					
	6C	Data science	T	4	4	25	75
		Data Science Lab	L	2	1	-	50
	7C	Python for Data science	T	4	4	25	75
		Python for Data Science Lab	L	2	1	-	50

Note: *Course type code: T: Theory, L: Lab, P: Problem solving

Note 1: For Semester–V, for the domain subject **COMPUTER SCIENCE**, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).

Note 2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations.

Note 3: To insert assessment methodology for Internship/ on the Job Training/Apprenticeship under the revised CBCS as per APSCHE Guidelines.

➢ **First internship (After 1st Year Examinations):** Community Service Project. To inculcate social responsibility and compassionate commitment among the students, the summer vacation in the intervening 1st and 2nd years of study shall be for Community Service Project (the detailed guidelines are enclosed).

➢ **Credit For Course: 04**

➢ **Second Internship (After 2nd Year Examinations):** Apprenticeship / Internship / on the job training / In-house Project / Off-site Project. To make the students employable, this shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years (the detailed guidelines are enclosed).

➢ **Credit For Course: 04**

➢ **Third internship/Project work (6th Semester Period):**
During the entire 6th Semester, the student shall undergo Apprenticeship / Internship / On the Job Training. This is to ensure that the students develop hands on technical skills which will be of great help in facing the world of work (the detailed guidelines are enclosed).

➢ **Credit For Course:12**

a. Proposed combination subjects: Computer Applications, Information Technology

b. Student eligibility for joining in the course:

c. Faculty eligibility for teaching the course:

d. List of Proposed Skill enhancement courses with syllabus, if any:

e. Any newly proposed Skill development/Life skill courses with draft syllabus and requiredresources

f. Required instruments/software/ computers for the course (Lab/Practical course-wiserequiredi.e., for a batch of 15 students)

Sem.No.	Lab/Practical Name	Names of Instruments/Software/ computers required with specifications	Brand Name	Qty Required
1	Problem Solving in C Lab	Intel desktop PC(80GB HDD,512MB DDR), Windows OS, C compiler with supportingeditors		15
2	Data Structures usingC Lab	Intel desktop PC(80GB HDD,512MB DDR), Windows OS, C compiler with supportingeditors		15
3	Database Management System Lab	Intel desktop PC(80GB HDD,512MB DDR), Windows OS,Oracle 8i/9i or SQL Server,MY SQL		15
4	Object Oriented Programming using Java Lab	Intel desktop PC(80GB HDD,512MB DDR), Windows OS, JDK		15
5	Operating SystemsLab using C/Java	Intel desktop PC(80GB HDD,512MB DDR), Windows OS, C compiler with supporting editors, JDK		15

g. List of Suitable levels of positions eligible in the Govt/Pvt organizations Suitable levels of positions for these graduates either in industry/govt organization like, technical assistants/ scientists/school teachers, clearly define them, with reliable justification

S.No	Position	Company/ Govt organization	Remarks	Additional skills required, if any
01	Software Programmer	IT Industry		
02	Software Developer	IT Industry		
03	Software Engineer	IT Industry		
04	Program Manager	IT Industry		
05	Clerk/PO	Banking Industry		
06	IT Specialist	Banking Industry		
07	Teacher/Lecturer/Asst.Prof	Education Institutes		
08	DB Admin	IT Industry/Medical		

h. List of Govt. organizations / Pvt companies for employment opportunities or internshipsor projects

S.No	Company/ Govt organization	Position type	Level of Position			
01	Software Development Industry					
02	E-Commerce Industry					
03	Medical Industry					
04	IT Industry					
05	Banking Industry					
06	Education Industry					

i. Any specific instructions to the teacher /paper setters/Exam-Chief Superintendent

PROGRAM OBJECTIVES, OUTCOMES, CO-CURRICULAR ANDASSESSMENT METHODS

B.Sc.	Computer Science

1. Aim and objectives of UG program in Subject: Computer Science
   The Objectives of this Program describes what students are expected to know and be able to do by the time of graduation. The Computer Science Department's Bachelor of Science program must enable students to attain, by the time of graduation:

   - An ability to identify, formulate and develop solutions to computational challenges.
   - An ability to design, implement and evaluate a computational system to meet desiredneeds within realistic constraints.
   - An ability to function effectively on teams to accomplish shared computing design, evaluation, or implementation goals.
   - An understanding of professional, ethical, legal, security, and social issues and responsibilities for the computing profession.
   - An ability to communicate and engage effectively with diverse stakeholders.
   - An ability to analyze impacts of computing on individuals, organizations, and society.
   - Recognition of the need for and ability to engage in continuing professional development.
   - An ability to use appropriate techniques, skills, and tools necessary for computing practice.
   - Effectively utilizing their knowledge of computing principles and mathematicaltheory to develop sustainable solutions to current and future computing problems.
   - Developing and implementing solution based systems and/or processes that addressissues and/or improve existing systems within in a computing based industry.

2. Learning outcomes of Subject Computer Science:
   - Students will be able to communicate in written and oral forms in such a way as to demonstrate their ability to present information clearly, logically, and critically.
   - Students will be able to apply mathematical and computing theoretical concepts in solution of common computing applications, such as computing the order of an algorithm.
   - Students will be able to complete successfully be able to program small-to-mid- size programs on their own. Sufficient programming skills will require use of good practice, e.g., good variable names, good use of computational units, appropriate commenting strategies.
   - Students will be able to use appropriately system design notations and apply system design engineering process in order to design, plan, and implement software systems
   - In a self-selected area of depth in Computing, students will demonstrate a depth of knowledge appropriate to graduate study and/or lifelong learning in that area. Students should be able to read for understanding materials in that area beyond those assigned in coursework.
   - Students will be prepared for a career in an information technology oriented business or industry, or for graduate study in computer science or other scientific or technical fields.
   - Use systems development, word-processing, spreadsheet, and presentation software tosolve basic information systems problems

3. Recommended Skill enhancement courses: (Titles of the courses given below and detailsof the syllabus for 4 credits (i.e., 2 units for theory and Lab/Practical) for 5 hrs class-cum-lab work.

4. Recommended Co-curricular activities: (Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)

   A. Measurable:
   1. Assignments
   2. Student seminars (Individual presentation of papers)
   3. Quiz Programmers
   4. Individual Field Studies/projects
   5. Group discussion
   6. Group/Team Projects

   B General:
   1. Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
   2. Group Discussions
   3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
   4. Any similar activities with imaginative thinking.

5. Recommended Continuous Assessment methods:

   Some of the following suggested assessment methodologies could be adopted;
   - The oral and written examinations (Scheduled and surprise tests).
   - Closed-book and open-book tests.
   - Coding exercises.
   - Practical assignments and laboratory reports.
   - Observation of practical skills.
   - Individual and group project reports.
   - Efficient delivery using seminar presentations.
   - Viva voce interviews.
   - Computerized adaptive testing, literature surveys and evaluations.
   - Peers and self-assessment, outputs form individual and collaborative work
.

DETAILS OF COURSE-WISE SYLLABUS

B Sc	Semester: I	Credits: 4
Course: 1	**PROBLEM SOLVING IN C**	Hrs/Wk: 4

Aim and objectives of Course:
- This course aims to provide exposure to problem-solving through programming.
- It introduces the concepts of the C Programming language.

Learning outcomes of Course:

Upon successful completion of the course, a student will be able to:
- Understand the evolution and functionality of a Digital Computer.
- Apply logical skills to analyse a given problem
- Develop an algorithm for solving a given problem.
- Understand 'C' language constructs like Iterative statements, Arrayprocessing, Pointers.
- Apply 'C' language constructs to the algorithms to write a 'C' languageprogram.

3. Detailed Syllabus: (Five units with each unit having 12 hours of class work)

UNIT I:
General Fundamentals: Introduction to computers: Block diagram of a computer, characteristics and limitations of computers, applications of computers, types of computers, computer generations.
Introduction to Algorithms and Programming Languages: Algorithm – Key features of Algorithms, Flow Charts, Programming Languages – Generations of Programming Languages – Structured Programming Language- Design and Implementation of Correct, Efficient and Maintainable Programs.

UNIT II:
Introduction to C: Introduction – Structure of C Program – Writing the first C Program – File used in C Program – Compiling and Executing C Programs – Using Comments – Keywords – Identifiers – Basic Data Types in C – Variables – Constants – I/O Statements in C- Operators in C- Programming Examples.
Decision Control and Looping Statements: Introduction to Decision Control Statements– Conditional Branching Statements – Iterative Statements – Nested Loops – Break and Continue Statement – Goto Statement

UNIT III:
Arrays: Introduction – Declaration of Arrays – Accessing elements of the Array – Storing Values in Array– Operations on Arrays – one dimensional, two dimensional and multi dimensional arrays, character handling and strings.

UNIT IV:
Functions: Introduction – using functions – Function declaration/ prototype – Functiondefinition – function call – return statement – Passing parameters – Scope of variables – Storage Classes – Recursive functions.
Structure, Union, and Enumerated Data Types: Introduction – Nested Structures – Arrays of Structures – Structures and Functions– Union – Arrays of Unions Variables – Unions inside Structures – Enumerated Data Types.

UNIT V:
Pointers: Understanding Computer Memory – Introduction to Pointers – declaring Pointer Variables – Pointer Expressions and Pointer Arithmetic – Null Pointers - Passing Arguments to Functions using Pointer – Pointer and Arrays – Memory Allocation in C Programs – Memory Usage – Dynamic Memory Allocation – Drawbacks of Pointers
Files: Introduction to Files – Using Files in C – Reading Rata from Files – Writing Data to Files – Detecting the End-of-file – Error Handling during File Operations – Accepting Command Line Arguments.

TEXT BOOKS:
1. E Balagurusamy – Programming in ANSIC – Tata McGraw-Hill publications.
2. Brain W Kernighan and Dennis M Ritchie - The 'C' Programming language" - Pearson publications.

REFERENCES:

1. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson EditionPublications.

2. YashavantKanetkar - Let Us 'C' – BPB Publications.

B Sc	Semester: I	Credits: 1
Course: 1(L)	**PROBLEM SOLVING IN C Lab**	Hrs/Wk: 2

1. Details of Lab Syllabus: **Problem solving in C LAB**

1. Write a program to check whether the given number is Armstrong or not.

2. Write a program to find the sum of individual digits of a positive integer..

3. Write a program to generate the first n terms of the Fibonacci sequence.

4. Write a program to find both the largest and smallest number in a list of integer values

5. Write a program to demonstrate refection of parameters in swapping of two integervalues using Call by Value & Call by Address

6. Write a program that uses functions to add two matrices.

7. Write a program to calculate factorial of given integer value using recursive functions

8. Write a program for multiplication of two N X N matrices.

9. Write a program to perform various string operations.

10. Write a program to search an element in a given list of values.

11. Write a program to sort a given list of integers in ascending order.

12. Write a program to calculate the salaries of all employees using *Employee (ID, Name, Designation, Basic Pay, DA, HRA, Gross Salary, Deduction, Net Salary)* structure.

    a. DA is 30 % of Basic Pay

    b. HRA is 15% of Basic Pay

    c. Deduction is 10% of (Basic Pay + DA)

    d. Gross Salary = Basic Pay + DA+ HRA

    e. Net Salary = Gross Salary – Deduction

13. Write a program to illustrate pointer arithmetic.

14. Write a program to read the data character by character from a file.

15. Write a program to create *Book (ISBN, Title, Author, Price, Pages, Publisher)* structure and store book details in a file and perform the following operations

    a. Add book details

    b. Search a book details for a given ISBN and display book details, if available

    c. Update a book details using ISBN

    d. Delete book details for a given ISBN and display list of remaining Books

5. RECOMMENDED CO-CURRICULAR ACTIVITIES:
    (Co-curricular activities shall not promote copying from textbook or from otherswork and shall encourage self/independent and group learning)

  A. Measurable
    1. Assignments (in writing and doing forms on the aspects of syllabuscontent and outside the syllabus content. Shall be individual and challenging)
    2. Student seminars (on topics of the syllabus and related aspects (individualactivity))
    3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
    4. Study projects (by very small groups of students on selected local real- time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity

  B. General
    1. Group Discussion
    2. Try to solve MCQ's available online.
    3. Others

6. RECOMMENDED CONTINUOUS ASSESSMENT METHODS:
    Some of the following suggested assessment methodologies could be adopted;

    1. The oral and written examinations (Scheduled and surprise tests),
    2. Closed-book and open-book tests,
    3. Problem-solving exercises,
    4. Practical assignments and laboratory reports,
    5. Observation of practical skills,
    6. Individual and group project reports like "Creating Text Editor in C".
    7. Efficient delivery using seminar presentations,
    8. Viva voce interviews.
    9. Computerized adaptive testing, literature surveys and evaluations,
    10. Peers and self-assessment, outputs form individual and collaborative work.

5.MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - I
Course 1: PROBLEM SOLVING IN C

Time: 3Hrs   Max.marks:75

Section - A

Answer any FIVE question   **5X5 = 25M**

1. Explain Block diagram of Computer.

2. Define an Algorithm. What are the key features of an algorithm?

3. Write about go to statement with syntax and example.

4. Dynamic memory allocation.

5. Explain pointers in arrays.

6. How to write data from files with example?

7. Write about enumerated data types.

8. Briefly explain various types of recursions.

Section - B

Answer ALL following question   **5X10 = 50M**

9. a) Briefly explain about generations of computers.

(OR)

b) What is a Flowchart? Explain significance with an example.

10. a) Explain basic data types in C?

(OR)

b) Explain about iterative statements available in C.

11. a) What is an Array? Explain different types of arrays with examples.

(OR)

b) What is a string? Explain various string handling functions available in C.

12. a) Define a function. Explain the passing parameter mechanism.

(OR)

b) Explain about Structure with syntax and example in detail.

13. a) Define and use of a pointer and write a 'C' program on swapping of two numbersusing pointers.

(OR)

b) Explain file modes in detail.

B Sc	Semester: II	Credits: 4
Course: 2	DATA STRUCTURES USING C	Hrs/Wk: 4

Aim and objectives of Course:
- To introduce the fundamental concept of data structures and to emphasize the importance of various data structures in developing and implementing efficient algorithms.

Learning outcomes of Course:
Upon successful completion of the course, a student will be able to:
- Understand available Data Structures for data storage and processing.
- Comprehend Data Structure and their real-time applications - Stack,Queue, Linked List, Trees and Graph
- Choose a suitable Data Structures for an application
- Develop ability to implement different Sorting and Search methods
- Have knowledge onData Structures basic operations like insert, delete,search,update and traversal
- Design and develop programs using various data structures
- Implement the applications of algorithms for sorting, pattern matching etc

Detailed Syllabus: (Five units with each unit having 12 hours of class work)

UNIT I:
Introduction to Data Structures: Introduction to the Theory of Data Structures, Data Representation, Abstract Data Types, Data Types, Primitive Data Types, Data Structure and Structured Type, Atomic Type, Difference between Abstract Data Types, Data Types, and Data Structures, Refinement Stages.
Principles of Programming and Analysis of Algorithms: Software Engineering, Program Design, Algorithms, Different Approaches to Designing an Algorithm, Complexity, Big 'O' Notation, Algorithm Analysis, Structured Approach to Programming, Recursion, Tips and Techniques for Writing Programs in 'C'.

UNIT II:
Arrays: Introduction to Linear and Non- Linear Data Structures, One- Dimensional Arrays, Array Operations, Two- Dimensional arrays, Multidimensional Arrays, Pointers and Arrays, an Overview of Pointers.
Linked Lists: Introduction to Lists and Linked Lists, Dynamic Memory Allocation, Basic Linked List Operations, Doubly Linked List, Circular Linked List, Atomic Linked List, Linked List in Arrays, Linked List versus Arrays.

UNIT III:
Stacks: Introduction to Stacks, Stack as an Abstract Data Type, Representation of Stacks through Arrays, Representation of Stacks through Linked Lists, Applications of Stacks,Stacks and Recursion.
Queues: Introduction, Queue as an Abstract data Type, Representation of Queues, Circular Queues, Double Ended Queues- Deques, Priority Queues, Application of Queues.

UNIT IV:
Binary Trees: Introduction to Non- Linear Data Structures, Introduction Binary Trees, Types of Trees, Basic Definition of Binary Trees, Properties of Binary Trees, Representation of Binary Trees, Operations on a Binary Search Tree, Binary Tree Traversal, Counting Number of Binary Trees, Applications of Binary Tree.

UNIT V:
Searching and sorting: Sorting – An Introduction, Bubble Sort, Insertion Sort, Merge Sort, Searching – An Introduction, Linear or Sequential Search, Binary Search, Indexed Sequential Search

Graphs: Introduction to Graphs, Terms Associated with Graphs, Sequential Representation of Graphs, Linked Representation of Graphs, Traversal of Graphs, Spanning Trees, Shortest Path, Application of Graphs.

TEXT BOOKS:

1. "Data Structures using C", ISRD group Second Edition, TMH

2. "Data Structures through C", Yashavant Kanetkar, BPB Publications

REFERENCES:

1. "Data Structures Using C" Balagurusamy E. TMH

B Sc	Semester: II	Credits: 1
Course: 2(L)	**DATA STRUCTURES USING C Lab**	Hrs/Wk: 2

Details of Lab Syllabus: **Data Structures Using C Lab**

a. Write a program to read 'N' numbers of elements into an array and also perform thefollowing operation on an array

     i. Add an element at the begging of an array

     ii. Insert an element at given index of array

     iii. Update a element using a values and index

     iv. Delete an existing element

b. Write a program using stacks to convert a given

     i. postfix expression to prefix

     ii. prefix expression to postfix

     iii. infix expression to postfix

c. Write Programs to implement the Stack operations using an array

d. Write Programs to implement the Stack operations using Liked List.

e. Write Programs to implement the Queue operations using an array.

f. Write Programs to implement the Queue operations using Liked List.

g. Write a program for arithmetic expression evaluation.

h. Write a program for Binary Search Tree Traversals

i. Write a program to implement dequeue using a doubly linked list.

j. Write a program to search an item in a given list using the following SearchingAlgorithms

     i. Linear Search

     ii. Binary Search.

k. Write a program for implementation of the following Sorting Algorithms

     i. Bubble Sort

     ii. Insertion Sort

     iii. Quick Sort

l. Write a program for polynomial addition using single linked list

m. Write a program to find out shortest path between given Source Node and DestinationNode in a given graph using Dijkstrar's algorithm.

n. Write a program to implement Depth First Search graph traversals algorithm

o. Write a program to implement Breadth First Search graph traversals algorithm

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from otherswork and shall encourage self/independent and group learning)

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabuscontent and outside the syllabus content. Shall be individual and challenging)
2. Student seminars (on topics of the syllabus and related aspects (individualactivity))
3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))
4. Study projects (by very small groups of students on selected local real- time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity

B. General

1. Group Discussion
2. Try to solve MCQ's available online.
3. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

p. The oral and written examinations (Scheduled and surprise tests),

q. Closed-book and open-book tests,

r. Problem-solving exercises,

s. Practical assignments and laboratory reports,

t. Observation of practical skills,

u. Individual and group project reports like "Creating Text Editor in C".

v. Efficient delivery using seminar presentations,

w. Viva voce interviews.

x. Computerized adaptive testing, literature surveys and evaluations,

y. Peers and self-assessment, outputs form individual and collaborative work.

ADIKAVI NANNAYA UNIVERSITY:: RAJAHMAHENDRAVARAM

B Sc Computer Science Syllabus(w.e.f: 2020-21 A.Y)

MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - II
Course 2: DATA STRUCTURES USING C

Time: 3Hrs   Max.marks:75

Section - A

Answer any FIVE question   **5X5 = 25M**

1. Explain about Abstract Data Types.

2. Define linear and non-linear data structures.

3. Explain Atomic Linked List.

4. What are the applications of stacks?

5. What is priority queue?

6. Explain about binary search tree.

7. Define sorting. What are the advantages and disadvantages of merge sort?

8. Briefly explain various representations of Graphics.

Section - B

Answer ALL following question   **5X10 = 50M**

9. a) What are primitive and non-primitive data structures with an example?

(OR)

b) Explain different approaches to designing an algorithm.

10. a) Explain different types of arrays.

(OR)

b) What is linked list? Explain different types of linked lists in data structures.

11. a) What is stack? Write ADT. Explain various operations of stack.

(OR)

b) What is a Deque? What are the different techniques used to represent Deque? Explain.

12. a) Write about different tree traveling techniques and write an algorithm for traveling techniques.

(OR)

b) Explain different applications and properties of binary tree.

13. a) Write about various Graph Travelling techniques.

(OR)

b) What is searching? Explain Linear Search Algorithm with example.

B Sc	Semester: III	Credits: 4
Course: 3	**DATABASE MANAGEMENTSYSTEM**	Hrs/Wk: 4

Aim and objectives of Course:
- The objective of the course is to introduce the design and development ofdatabases with special emphasis on relational databases.

Learning outcomes of Course: Upon successful completion of the course, a student will be able to:
- Gain knowledge of Database and DBMS.
- Understand the fundamental concepts of DBMS with special emphasis onrelational data model.
- Demonstrate an understanding of normalization theory and apply suchknowledge to the normalization of a database
- Model data base using ER Diagrams and design database schemas based on themodel.
- Create a small database using SQL.
- Store, Retrieve data in database.

Detailed Syllabus: (Five units with each unit having 12 hours of class work)

UNIT I:
Overview of Database Management System: Introduction to data, information, database, database management systems, file-based system, Drawbacks of file-Based System, database approach, Classification of Database Management Systems, advantages of database approach, Various Data Models, Components of Database Management System, three schema architecture of data base, costs and risks of database approach**.**

UNIT II:
Entity-Relationship Model: Introduction, the building blocks of an entity relationship diagram, classification of entity sets, attribute classification, relationship degree, relationship classification, reducing ER diagram to tables, enhanced entity-relationship model (EER model), generalization and specialization, IS A relationship and attribute inheritance, multiple inheritance, constraints on specialization and generalization, advantages of ER modeling.

UNIT III:
Relational Model: Introduction, CODD Rules, relational data model, concept of key, relational integrity, relational algebra, relational algebra operations, advantages of relational algebra, limitations of relational algebra, relational calculus, tuple relational calculus, domain relational Calculus (DRC), Functional dependencies and normal forms upto 3rd normal form.

UNIT IV:
Structured Query Language: Introduction, History of SQL Standard, Commands in SQL, Data Types in SQL, Data Definition Language, Selection Operation, Projection Operation, Aggregate functions, Data Manipulation Language, Table Modification Commands, Join Operation, Set Operations, View, Sub Query.

UNIT V
PL/SQL: Introduction, Shortcomings of SQL, Structure of PL/SQL, PL/SQL Language Elements, Data Types, Operators Precedence, Control Structure, Steps to Create a PL/SQL, Program, Iterative Control, Procedure, Function, Database Triggers, Types of Triggers.

TEXT BOOKS:
1. Database System Concepts by Abraham Silberschatz, Henry Korth, and S. Sudarshan, McGrawhill
2. Database Management Systems by Raghu Ramakrishnan, McGrawhill

REFERENCES:
1. Principles of Database Systems by J. D. Ullman
2. Fundamentals of Database Systems by R. Elmasri and S. Navathe
3. SQL: The Ultimate Beginners Guide by Steve Tale.

B Sc	Semester: III	Credits: 1
Course: 3(L)	**DATABASE MANAGEMENT SYSTEM LAB**	**Hrs/Wk: 2**

Details of Lab Syllabus: DATABASE MANAGEMENT SYSTEM LAB

1. Draw ER diagram for hospital administration

2. Creation of college database and establish relationships between tables

3. Relational database schema of a company is given in the following figure.

   Relational Database Schema - COMPANY
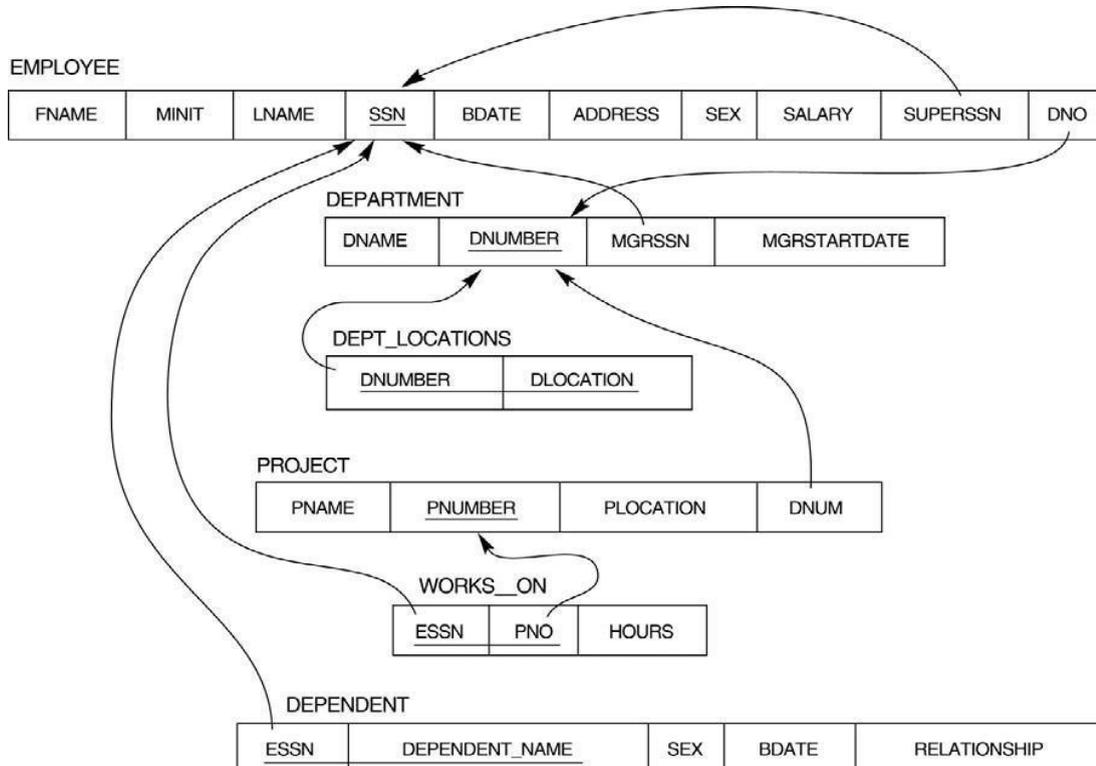
Questions to be performed on above schema

1. Create above tables with relevant *Primary Key, Foreign Key and other constraints*

2. Populate the tables with data

3. Display all the details of all employees working in the company.

4. Display *ssn, lname, fname, address* of employees who work in department no 7.

5. Retrieve the *Birthdate and Address* of the employee whose name is 'Franklin T.Wong'

6. Retrieve the name and salary of every employee.

7. Retrieve all distinct salary values

8. Retrieve all employee names whose address is in 'Bellaire'

9. Retrieve all employees who were born during the 1950s

10. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000 (inclusive)

11. Retrieve the names of all employees who do not have supervisors

12. Retrieve SSN and department name for all employees

13. Retrieve the name and address of all employees who work for the 'Research'department

14. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birth date.

15. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.

16. Retrieve all combinations of Employee Name and Department Name

17. Make a list of all project numbers for projects that involve an employee whose last name is 'Narayan' either as a worker or as a manager of the department that controls the project.

18. Increase the salary of all employees working on the 'ProductX' project by 15%. Retrieve employee name and increased salary of these employees.

19. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employee first name.

20. Select the names of employees whose salary does not match with salary of any employee in department.

21. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford.

22. Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary. Display with proper headings

23. Find the sum of the salaries and number of employees of all employees of the 'Marketing' department, as well as the maximum salary, the minimum salary, and the average salary in this department.

24. Select the names of employees whose salary is greater than the average salary of all employees in department 10.

25. Delete all dependents of employee whose *ssn is '123456789'*.

26. Perform a query using alter command to drop/add field and a constraint in Employeetable.

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from otherswork and shall encourage self/independent and group learning)

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabuscontent and outside the syllabus content. Shall be individual and challenging)

2. Student seminars (on topics of the syllabus and related aspects (individualactivity))

3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))

4. Study projects (by very small groups of students on selected local real- time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity

B. General

1. Group Discussion

2. Try to solve MCQ's available online.

3. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),

2. Closed-book and open-book tests,

3. Problem-solving exercises,

4. Practical assignments and laboratory reports,

5. Observation of practical skills,

6. Individual and group project reports like "Creating Text Editor in C".

7. Efficient delivery using seminar presentations,

8. Viva voce interviews.

9. Computerized adaptive testing, literature surveys and evaluations,

10. Peers and self-assessment, outputs form individual and collaborative work.

MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - III
Course 3: DATABASE MANAGEMENT SYSTEM

Time: 3Hrs   Max.marks:75

Section - A

Answer any FIVE question   5X5 = 25M

1. Explain disadvantages of file processing system?

2. Explain the concept of entity and entity set with suitable example.

3. Explain about various attribute classification.

4. What are the advantages of Relational algebra? Explain.

5. Explain various types of keys.

6. Explain the selection command with an example.

7. Explain sub queries.

8. Explain structure of PL/SQL.

Section - B

Answer ALL following question   5X10 = 50M

9. a) With a neat diagram, explain the architecture of a DBMS.

(OR)

b) Explain about Data Models.

10. a) Explain about Specialization and Generalization in EER model.

(OR)

b) What is ER-Modeling? Write advantages and disadvantages of ER-Modelling.

11. a) What is Functional Dependency? Explain difference between 3NF and BCNF?

(OR)

b) What is relational model? Write about key features of relational model.

12. a) What is SQL? Explain different types of commands in SQL.

(OR)

b) What is Nested Queries? How to create them? Discuss it with relevant example.

13. a) Explain steps in creating a PL/SQL Program.

(OR)

b) Explain about Triggers and types of triggers.

B Sc	Semester: IV	Credits: 4
Course: 4	**OBJECT ORIENTED PROGRAMMING USING JAVA**	Hrs/Wk: 4

Aim and objectives of Course:
- To introduce the fundamental concepts of Object-Oriented programming and todesign & implement object oriented programming concepts in Java.

Learning outcomes of Course:
- Understand the benefits of a well-structured program
- Understand different computer programming paradigms
- Understand underlying principles of Object-Oriented Programming in Java
- Develop problem-solving and programming skills using OOP concepts
- Develop the ability to solve real-world problems through software developmentin high-level programming language like Java

Detailed Syllabus: (Five units with each unit having 12 hours of class work)

UNIT I:
Introduction to Java: Features of Java, The Java virtual Machine, Parts of Java
Naming Conventions and Data Types: Naming Conventions in Java, Data Types in Java, Literals
Operators in Java: Operators, Priority of Operators. **Control Statements in Java**: if... else Statement, do... while Statement, while Loop, for Loop, switch Statement, break Statement, continue Statement, return Statement. **Input and Output:** Accepting Input from the Keyboard, Reading Input with Java.util.Scanner Class, Displaying Output with System.out.printf(), Displaying Formatted Output with String.format(). **Arrays:** Types of Arrays, Three Dimensional Arrays (3D array), array name. length, Command Line Arguments

UNIT II:
Strings: Creating Strings, String Class Methods, String Comparison, Immutability of Strings. **Introduction to OOPs**: Problems in Procedure Oriented Approach, Features of Object- Oriented Programming System (OOPS). **Classes and Objects**: Object Creation, Initializing the Instance Variables, Access Specifiers,Constructors.
Methods in Java: Method Header or Method Prototype, Method Body, Understanding Methods, Static Methods, Static Block, The keyword 'this', Instance Methods, Passing Primitive Data Types to Methods, Passing Objects to Methods, Passing Arrays to Methods, Recursion, Factory Methods. **Inheritance:** Inheritance, The keyword 'super', The Protected Specifier, Types ofInheritance.

UNIT III:
Polymorphism: Polymorphism with Variables, Polymorphism using Methods, Polymorphism with Static Methods, Polymorphism with Private Methods, Polymorphism with Final Methods, final Class.
Type Casting: Types of Data Types, Casting Primitive Data Types, Casting Referenced Data Types, The Object Class. **Abstract Classes**: Abstract Method and Abstract Class.
Interfaces: Interface, Multiple Inheritance using Interfaces. **Packages:** Package, Different Types of Packages, The JAR Files, Interfaces in a Package, Creating Sub Package in a Package, Access Specifiers in Java, Creating API Document. **Exception Handling:** Errors in Java Program, Exceptions, throws Clause, throw Clause, Types of Exceptions, Re – throwing an Exception.

UNIT – IV
Streams: Stream, Creating a File using FileOutputStream, Reading Data from a File uingFileInputStream, Creating a File using FileWriter, Reading a File using FileReader, Zipping and Unzipping Files, Serialization of Objects, Counting Number of Characters in a File, File Copy, File Class

Threads: Single Tasking, Multi Tasking, Uses of Threads, Creating a Thread and Running it, Terminating the Thread, Single Tasking Using a Thread, Multi Tasking Using Threads, Multiple Threads Acting on Single Object, Thread Class Methods, Deadlock of Threads, Thread Communication, Thread Priorities, thread Group, Daemon Threads, Applications of Threads, Thread Life Cycle.

UNIT V:
Applets: Creating an Applet, Uses of Applets, <APPLET> tag, A Simple Applet, An Applet with Swing Components, Animation in Applets, A Simple Game with an Applet, Applet Parameters.
Java Database Connectivity: Database Servers, Database Clients, JDBC (Java Database Connectivity), Working with Oracle Database, Working with MySQL Database, Stages in a JDBC Program, Registering the Driver, Connecting to a Database, Preparing SQL Statements, Using jdbc–odbc Bridge Driver to Connect to Oracle Database, Retrieving Data from MySQL Database, Retrieving Data from MS Access Database, Stored Procedures and CallableStatements, Types of Result Sets.

TEXT BOOKS:

1. Core Java: An Integrated Approach, Authored by Dr. R. Nageswara Rao &Kogent Learning Solutions Inc.

2. E.Balaguruswamy, Programming with JAVA, A primer, 3e, TATA McGraw- HillCompany.

REFERENCES:

1. John R. Hubbard, Programming with Java, Second Edition, Schaum's outlineSeries, TMH.

2. Deitel&Deitel. Java TM: How to Program, PHI (2007)

B Sc	Semester: IV	Credits: 1
Course: 4(L)	**Object Oriented Programming using Java Lab**	Hrs/Wk: 2

Details of Lab Syllabus: Object Oriented Programming using Java Lab

1. Write a program to read *Student Name, Reg.No, Marks[5]* and calculate *Total*,*Percentage, Result*. Display all the details of students

2. Write a program to perform the following String Operations
   a. Read a string
   b. Find out whether there is a given substring or not
   c. Compare existing string by another string and display status
   d. Replace existing string character with another character
   e. Count number of works in a string

3. Java program to implements Addition and Multiplication of two N X N matrices.

4. Java program to demonstrate the use of Constructor.

5. Calculate area of the following shapes using method overloading.
   a. Triangle
   b. Rectangle
   c. Circle
   d. Square

6. Implement inheritance between *Person (Aadhar, Surname, Name, DOB, and Age)* and *Student (Admission Number, College, Course, Year)*classes where ReadData(),DisplayData() are overriding methods.

7. Java program for implementing Interfaces

8. Java program on Multiple Inheritance.

9. Java program for to display *Serial Number from 1 to N* by creating two Threads

10. Java program to demonstrate the following exception handlings
    e. Divided by Zero
    f. Array Index Out of Bound
    g. File Not Found
    h. Arithmetic Exception
    i. User Defined Exception

11. Create an Applet to display different shapes such as Circle, Oval, Rectangle, Square and Triangle.

12. Write a program to create *Book (ISBN,Title, Author, Price, Pages, Publisher)*structure and store book details in a file and perform the following operations
    j. Add book details
    k. Search a book details for a given ISBN and display book details, if available
    l. Update a book details using ISBN
    m. Delete book details for a given ISBN and display list of remaining Books

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from otherswork and shall encourage self/independent and group learning)

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabuscontent and outside the syllabus content. Shall be individual and challenging)

2. Student seminars (on topics of the syllabus and related aspects (individualactivity))

3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))

4. Study projects (by very small groups of students on selected local real- time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

B. General

1. Group Discussion

2. Try to solve MCQ's available online.

3. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),

2. Closed-book and open-book tests,

3. Problem-solving exercises,

4. Practical assignments and laboratory reports,

5. Observation of practical skills,

6. Individual and group project reports like "Creating Text Editor in C".

7. Efficient delivery using seminar presentations,

8. Viva voce interviews.

9. Computerized adaptive testing, literature surveys and evaluations,

10. Peers and self-assessment, outputs form individual and collaborative work.

MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - IV
Course 4: OBJECT ORIENTED PROGRAMMING USING JAVA

Time: 3Hrs   Max.marks:75

Section - A

Answer any FIVE question   **5X5 = 25M**

1. Explain about JVM.

2. Explain about factory methods.

3. Explain about 'this' keyword with example.

4. Explain about Type casting.

5. Define Abstract class and Abstract method.

6. Explain Zipping and Unzipping files.

7. How to terminate a thread.

8. Explain JDBC.

Section - B

Answer ALL following question   **5X10 = 50M**

9. a) Explain Looping statements in JAVA.

(OR)

   b) Explain operators and types of operators.

10. a) Explain Inheritance and types of Inheritance.

(OR)

   b) Explain constructors and types of constructors with an example.

11. a) Describe Interface? Critically explain and define Accessing Interface variable.

(OR)

   b) Explain concept of Exception handling.

12. a) Explain the concept of Creating a file using File Writer using an example program.

(OR)

   b) Discuss Thread Life Cycle.

13. a) Define Applet. Explain how to create an Applet.

(OR)

   b) Explain the procedure to connect Oracle Database using jdbc-odbc driver.

B Sc	Semester: IV	Credits: 4
Course: 5	OPERATING SYSTEMS	Hrs/Wk: 4

Aim and objectives of Course:

- This course aims to introduce the structure and organization of a file system. It emphasizes various functions of an operating system like memory management, process management, device management, etc.

Learning outcomes of Course:

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

- Know Computer system resources and the role of operating system in resourcemanagement with algorithms
- Understand Operating System Architectural design and its services.
- Gain knowledge of various types of operating systems including Unix andAndroid.
- Understand various processmanagement concepts including scheduling, synchronization, and deadlocks.
- Have a basic knowledge about multithreading.
- Comprehend different approaches for memory management.
- Understand and identify potential threats to operating systems and the securityfeatures design to guard against them.
- Specify objectives of modern operating systems and describe how operatingsystems have evolved over time.
- Describe the functions of a contemporary operating system

Detailed Syllabus: (Five units with each unit having 12 hours of class work)

UNIT I:

What is Operating System? History and Evolution of OS, Basic OS functions, Resource Abstraction, Types of Operating Systems– Multiprogramming Systems, Batch Systems, Time Sharing Systems; Operating Systems for Personal Computers, Workstations and Hand-held Devices, Process Control & Real time Systems.

UNIT II:

Processor and User Modes, Kernels, System Calls and System Programs, System View of the Process and Resources, Process Abstraction, Process Hierarchy, Threads, Threading Issues, Thread Libraries; Process Scheduling, Non-Preemptive and Preemptive Scheduling Algorithms.

UNIT III:

Process Management: Deadlock, Deadlock Characterization, Necessary andSufficient Conditions for Deadlock, Deadlock Handling Approaches: Deadlock Prevention, Deadlock Avoidance and Deadlock Detection and Recovery. Concurrent and Dependent Processes, Critical Section, Semaphores, Methods for Inter- process Communication; Process Synchronization, Classical Process Synchronization Problems: Producer-Consumer, Reader-Writer.

UNIT IV:

Memory Management: Physical and Virtual Address Space; MemoryAllocation Strategies– Fixed and -Variable Partitions, Paging, Segmentation, Virtual Memory.

UNIT V:

File and I/O Management, OSsecurity : Directory Structure, File Operations, File Allocation Methods, Device Management, Pipes, Buffer, Shared Memory, Security Policy Mechanism, Protection, Authentication and Internal Access Authorization Introduction to Android Operating System, Android Development Framework, AndroidApplication Architecture, Android Process Management and File System, SmallApplication Development using Android Development Framework.

TEXT BOOKS:

1. Operating System Principles by Abraham Silberschatz, Peter Baer Galvin and GregGagne

    (7thEdition) Wiley India Edition.

2. Operating Systems: Internals and Design Principles by Stallings (Pearson)

REFERENCES:

1. Operating Systems by J. Archer Harris (Author), Jyoti Singh (Author) (TMH)
2. Online Resources for UNIT V

B Sc	Semester: IV	Credits: 1
Course: 5(L)	Operating Systems Lab using C/Java	Hrs/Wk: 2

Details of Lab Syllabus: **Operating Systems Lab using C/Java**

1. Write a program to implement Round Robin CPU Scheduling algorithm

2. Simulate SJF CPU Scheduling algorithm

3. Write a program the FCFS CPU Scheduling algorithm

4. Write a program to Priority CPU Scheduling algorithm

5. Simulate Sequential file allocation strategies

6. Simulate Indexed file allocation strategies

7. Simulate Linked file allocation strategies

8. Simulate MVT and MFT memory management techniques

9. Simulate Single level directory File organization techniques

10. Simulate Two level File organization techniques

11. Simulate Hierarchical File organization techniques

12. Write a program for Bankers Algorithm for Dead Lock Avoidance

13. Implement Bankers Algorithm Dead Lock Prevention.

14. Simulate all Page replacement algorithms.

    a) FIFO

    b) LRU

    c) LFU

15. Simulate Paging Techniques of memory management

RECOMMENDED CO-CURRICULAR ACTIVITIES:

(Co-curricular activities shall not promote copying from textbook or from otherswork and shall encourage self/independent and group learning)

A. Measurable

1. Assignments (in writing and doing forms on the aspects of syllabus contentand outside the syllabus content. Shall be individual and challenging)

2. Student seminars (on topics of the syllabus and related aspects (individual activity))

3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams))

4. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity

B. General

1. Group Discussion
2. Try to solve MCQ's available online.
3. Others

RECOMMENDED CONTINUOUS ASSESSMENT METHODS:

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),

2. Closed-book and open-book tests,

3. Problem-solving exercises,

4. Practical assignments and laboratory reports,

5. Observation of practical skills,

6. Individual and group project reports like "Creating Text Editor in C".

7. Efficient delivery using seminar presentations,

8. Viva voce interviews.

9. Computerized adaptive testing, literature surveys and evaluations,

10. Peers and self-assessment, outputs form individual and collaborative work.

MODEL QUESTION PAPER (Sem-end. Exam)B.Sc DEGREE EXAMINATIONS

Semester - IV

Course 5: OPERATING SYSTEMS

Time: 3Hrs   Max.marks:75

Section - A

Answer any FIVE question   **5X5 = 25M**

1. Write about Resource Abstraction.

2. Write about the process and the process state.

3. Explain threading issues.

4. Explain about process Synchronization.

5. Discuss some necessary and sufficient conditions for deadlock.

6. Explain about Virtual memory.

7. Explain about shared memory.

8. Write about file types.

Section - B

Answer ALL following question   **5X10 = 50M**

9. a) Explain various types of Operating Systems.

(OR)

b) What is Operating System? Explain functions of Operating System.

10. a) Explain in detail about Process Scheduling.

(OR)

b) Explain system view of the process and resources.

11. a) Explain about deadlock Detection and recovery.

(OR)

b) Discuss classical process synchronization problems.

12. a) Explain the following

   i) Segmentation

   ii) Fixed and variable partitions.

(OR)

b) Explain in detail about Demand-paging.

13. a) Explain Authentication and Internal Access Authorization.

(OR)

b) Explain Android Development Framework.

B Sc	Semester :V(Skill Enhancement Course - Elective)	Credits: 4
Course: 6A	**Web Interface Designing Technologies**	Hrs/Wk: 4

Learning Outcomes: Students after successful completion of the course will be able to:

1. Understand and appreciate the web architecture and services.
2. Gain knowledge about various components of a website.
3. Demonstrate skills regarding creation of a static website and an interface to dynamic website.
4. Learn how to install word press and gain the knowledge of installing various plugins to use in their websites.

Syllabus: *(Total Hours: 90 including Teaching, Lab, and Field training, Unit tests etc.)*

UNIT I: (10 hours)
HTML: Introduction to web designing, difference between web applications and desktop applications, introduction to HTML, HTML structure, elements, attributes, headings, paragraphs, styles, colours, HTML formatting, Quotations, Comments, images, tables, lists, blocks and classes, HTML CSS, HTML frames, file paths, layout, symbols, HTML responsive.

UNIT II: (10 hours)
HTML forms: HTML form elements, input types, input attributes, HTML5, HTML graphics, HTML media – video, audio, plug INS, you tube.
HTML API'S: Geo location, Drag/drop, local storage, HTML SSE.
CSS: CSS home, introduction, syntax, colours, back ground, borders, margins, padding, height/width, text, fonts, icons, tables, lists, position, over flow, float, CSS combinators, pseudo class, pseudo elements, opacity, tool tips, image gallery, CSS forms, CSS counters, CSS responsive.

UNIT III: (10 hours)
Client side Validation: Introduction to JavaScript - What is DHTML, JavaScript, basics, variables, string manipulations, mathematical functions, statements, operators, arrays, functions. Objects in JavaScript - Data and objects in JavaScript, regular expressions, exception handling. DHTML with JavaScript **-** Data validation, opening a new window, messages and confirmations, the status bar, different frames, rollover buttons, moving images.

UNIT IV: (10 hours)
Word press: Introduction to word press, servers like wamp, bitnami e.tc, installing and configuring word press, understanding admin panel, working with posts and pages, using editor, text formatting with shortcuts, working with media-Adding, editing, deleting media elements, working with widgets, menus.

UNIT V: (10 hours)
Working with themes-parent and child themes, using featured images, configuring settings, user and user roles and profiles, adding external links, extending word press with plug-ins. Customizing the site, changing the appearance of site using css , protecting word press website from hackers.

REFERENCES

1. Chris Bates, Web Programming Building Internet Applications, Second Edition, Wiley (2007)
2. Paul S.WangSanda S. Katila, an Introduction to Web Design plus Programming, Thomson (2007).
3. Head First HTML and CSS, Elisabeth Robson, Eric Freeman, O'Reilly Media Inc.
4. An Introduction to HTML and JavaScript: for Scientists and Engineers, David R. Brooks. Springer, 2007
5. Schaum's Easy Outline HTML, David Mercer, Mcgraw Hill Professional.
6. Word press for Beginners, Dr.Andy Williams.
7. Professional word press, Brad Williams, David damstra, Hanstern.
8. Web resources:
    a. http://www.codecademy.com/tracks/web
    b. http://www.w3schools.com
    c. https://www.w3schools.in/wordpress-tutorial/
    d. http://www.homeandlearn.co.uk
9. Other web sources suggested by the teacher concerned and the college librarianincluding reading material.

Co-Curricular Activities

a) **Mandatory:** *(Training of students by teacher in field related skills: (lab: 10 + field: 05) :*
  1. **For Teacher**: Field related training of students by the teacher in laboratory/field for not less than 15 hours on identifying the case study to build a website, designing the format, structure, menus, submenus etc for a website and finally to build a website.
  2. **For Student**: Students shall (individually) search online and visit any of the agencies like hotels, hospitals, super bazaars, organizations, etc. where there is a need for a website and identify any one case study and submit a hand-written Fieldwork/Project work/Project work/Project work/Project work Report not exceeding 10 pages. Example: Choosing a firm or business to develop a website, identifying various business entities to be included in the website, identifying menu bar and content to be placed in their websites.
  3. Max marks for Fieldwork/Project work/Project work/Project work/Project work/Projectwork Report: 05.
  4. Suggested Format for Fieldwork/Project work/Project work/Project work/Project work: *Title page, student details, index page, details of place visited, observations, findings andacknowledgements*.
  5. Unit tests (IE).

b) **Suggested Co-Curricular Activities**
  1. Build a website with 10 pages for the case study identified.
  2. Training of students by related industrial experts.
  3. Assignments
  4. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
  5. Presentation by students on best websites.

B Sc	**Semester :V**(Skill Enhancement Course - Elective)	**Credits: 1**
Course: 6A	**Web Interface Designing Technologies Lab**	**Hrs/Wk: 2**

Web Interface Designing Technologies – PRACTICAL SYLLABUS

Learning Outcomes:

> On successful completion of this practical course, student shall be able to:
> 1. Create a basic website with the help of HTML and CSS.
> 2. Acquire the skill of installing word press and various plugins of Word press.
> 3. Create a static website with the help of Word press.
> 4. Create an interface for a dynamic website.
> 5. Apply various themes for their websites using Word press.

Practical (Laboratory) Syllabus: *(30 hrs.)*

HTML and CSS:

1. Create an HTML document with the following formatting options:

   (a) Bold, (b) Italics, (c) Underline, (d) Headings (Using H1 to H6 heading styles), (e) Font (Type, Size and Color), (f) Background (Colored background/Image in background), (g) Paragraph, (h) Line Break, (i) Horizontal Rule, (j) Pre tag

2. Create an HTML document which consists of:

   (a) Ordered List (b) Unordered List (c) Nested List (d) Image

3. Create a Table with four rows and five columns. Place an image in one column.

4. Using "table" tag, align the images as follows:

5. Create a menu form using html.

6. Style the menu buttons using css.

7. Create a form using HTML which has the following types of controls:

(a) Text Box (b) Option/radio buttons (c) Check boxes (d) Reset and Submit buttons

8. Embed a calendar object in your web page.

9. Create an applet that accepts two numbers and perform all the arithmetic operationson them.

10. Create nested table to store your curriculum.

11. Create a form that accepts the information from the subscriber of a mailing system.

12. Design the page as follows:
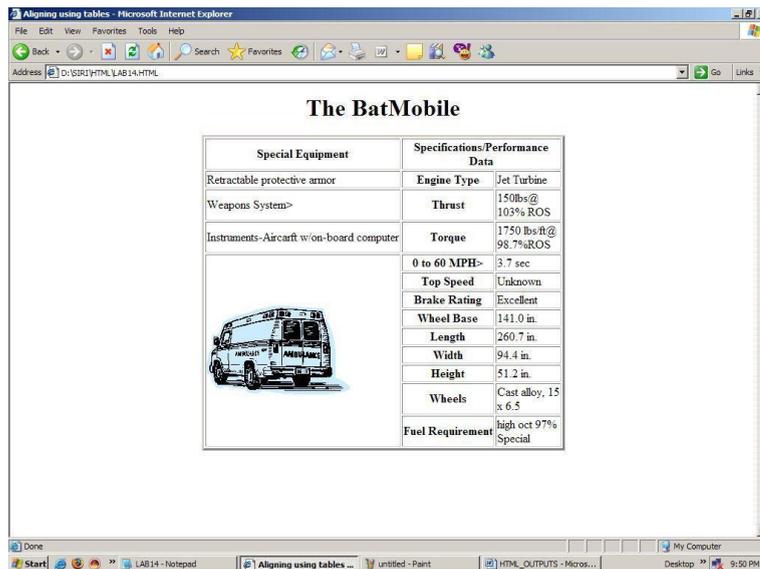
13. Create a help file as follows:

14. Create a webpage containing your bio data (assume the form and fields).

15. Write a html program including style sheets.

16. Write a html program to layers of information in web page.

17. Create a static webpage.

Word press:

1. Installation and configuration of word press.

2. Create a site and add a theme to it.20 Create a child theme

3. Create five pages on COVID – 19 and link them to the home page. .

4. Create a simple post with featured image.

5. Add an external video link with size 640 X 360.

6. Create a user and assign a role to him.

7. Create a login page to word press using custom links

8. Create a website for your college.

MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - V (Skill Enhancement Course - Elective)
Course 6A: Web Interface Designing Technologies

Time: 3Hrs   **Max.marks:75**

Section - A

Answer any FIVE question   **5X5 = 25M**

1. Write the differences between web applications and desktop applications
2. Explain about table properties in HTML.
3. Write about HTML form elements.
4. Write the syntax for colours and borders in CSS.
5. Write the differences between HTML and DHTML.
6. Explain about Data and Objects in Java Script.
7. Write about wamp server.
8. Write about parent and child themes.

Section - B

Answer ALL following question   **5X10 = 50M**

9. a) Explain about different types of Lists in HTML with examples.

(or)

b) Explain HTML frames with example.

10. a) Explain about HTML media.

(or)

b) Explain about CSS counters and CSS responsive.

11 a) Explain about String manipulations in Java Script.

(or)

b) Explain about Data validation in Java Script with example.

12 a) Explain about installing and configuring word press.

(or)

b) Explain about media adding, editing, deleting media elements.

13 a) Explain about extending word press with plug-ins.

(or)

b) Explain about protecting word press website from hackers.

B Sc	**Semester :V**(Skill Enhancement Course - Elective)	**Credits: 4**
Course: 7A	**Web Applications Development using PHP& MYSQL**	**Hrs/Wk: 4**

Learning Outcomes:
Students after successful completion of the course will be able to:
1. Write simple programs in PHP.
2. Understand how to use regular expressions, handle exceptions, and validate data usingPHP.
3. Apply In-Built functions and Create User defined functions in PHP programming.
4. Write PHP scripts to handle HTML forms.
5. Write programs to create dynamic and interactive web based applications using PHPand MYSQL.
6. Know how to use PHP with a MySQL database and can write database driven webpages.

Syllabus: *(Total Hours: 90 including Teaching, Lab, and Field training, Unit tests etc.)*

UNIT I: (10 hours)

The Building blocks of PHP: Variables, Data Types, Operators and Expressions, Constants. Flow Control Functions in PHP: Switching Flow, Loops, Code Blocks and Browser Output. Working with Functions: What is function?, Calling functions, Defining Functions, Returning the values from User-Defined Functions, Variable Scope, Saving state between Function calls with the static statement, more about arguments.

UNIT II: (10 hours)
Working with Arrays: What are Arrays? Creating Arrays, Some Array-Related Functions. Working with Objects: Creating Objects, Object Instance Working with Strings, Dates and Time: Formatting strings with PHP, Investigating Strings with PHP, Manipulating Strings with PHP, Using Date and Time Functions in PHP.

UNIT III: (10 hours)
Working with Forms: Creating Forms, Accessing Form Input with User defined Arrays, Combining HTML and PHP code on a single Page, Using Hidden Fields to save state, Redirecting the user, Sending Mail on Form Submission, and Working with File Uploads. Working with Cookies and User Sessions: Introducing Cookies, Setting a Cookie with PHP, Session Function Overview, Starting a Session, Working with session variables, passing session IDs in the Query String, Destroying Sessions and Unsetting Variables, Using Sessions in an Environment with Registered Users.

UNIT IV: (10 hours)
Working with Files and Directories: Including Files with inclue(), Validating Files, Creating and Deleting Files, Opening a File for Writing, Reading or Appending, Reading from Files, Writing or Appending to a File, Working with Directories, Open Pipes to and from Process Using popen(), Running Commands with exec(), Running Commands with system() or passthru().

Working with Images: Understanding the Image-Creation Process, Necessary Modifications to PHP, Drawing a New Image, Getting Fancy with Pie Charts, Modifying Existing Images, Image Creation from User Input.

UNIT V: (10 hours)

Interacting with MySQL using PHP: MySQL Versus MySQLi Functions, Connecting to MySQL with PHP, Working with MySQL Data. Creating an Online Address Book: Planning and Creating Database Tables, Creating Menu, Creating Record Addition Mechanism, Viewing Records, Creating the Record Deletion Mechanism, Adding Sub-entities to a Record.

REFERENCES:

1. Julie C. Meloni, SAMS Teach yourself PHP MySQL and Apache, Pearson Education (2007).
2. Steven Holzner , PHP: The Complete Reference, McGraw-Hill
3. Robin Nixon, Learning PHP, MySQL, JavaScript, CSS & HTML5, Third EditionO'reilly, 2014
4. Xue Bai Michael Ekedahl, The web warrior guide to Web Programming, Thomson(2006).
5. Web resources:
   e. http://www.codecademy.com/tracks/php
   f. http://www.w3schools.com/PHP
   g. http://www.tutorialpoint.com

6. Other web sources suggested by the teacher concerned and the college librarianincluding reading material.

Co-Curricular Activities:

a) **Mandatory:** *(Training of students by teacher in field related skills: (lab: 10 + field: 05) :*
   1. **For Teacher**: Field related training of students by the teacher in laboratory/field for not less than 15 hours on demonstrating various **interactive and dynamic websites** available online, addressing the students on identifying the case study to build an interactive and database driven website, forms to be used in website, database to be maintained, reports to be produced, etc.
   2. **For Student**: Students shall (individually) search online and visit any of the agencies like malls, hotels, super bazaars, etc. where there is a need for an interactive and database driven website and submit a hand-written Fieldwork/Project work/Project work/Project work/Project work Report not exceeding 10 pages. Example: Choosing a firm or business to develop a website, identifying forms to be placed in the websites, back end databases to be maintained and reports to be generated and placed in the websites.
   3. Max marks for Fieldwork/Project work/Project work/Project work/Project work/Projectwork Report: 05.

   4. Suggested Format for Fieldwork/Project work/Project work/Project work/Project work: *Title page, student details, index page, details of place or websites visited, structure of thewebsite and acknowledgements*.
   5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Arrange expert lectures by IT experts working professionally in the area of web contentdevelopment
2. Assignments (in writing or implementing contents related to syllabus or outside the syllabus. Shall be individual and challenging)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation by students on best websites.
5. Arrange a webpage development competition among small groups of students.

B Sc	Semester :**V**(Skill Enhancement Course - Elective)	Credits: 4
Course: 7A	**Web Applications Development using PHP& MYSQL Lab**	Hrs/Wk: 4

Web Applications Development using PHP & MYSQL–PRACTICAL SYLLABUS

Learning Outcomes:

On successful completion of this practical course, student shall be able to:

1. Write, debug and implement the Programs by applying concepts and error handling techniques of PHP.

2. Create an interactive and dynamic website.

3. Create a website with reports generated from a database.

4. Write programs to create an interactive website for e-commerce sites like online shopping, etc.

Practical (Laboratory) Syllabus: *(30 hrs.)*

1. Write a PHP program to Display "Hello"
2. Write a PHP Program to display the today's date.
3. Write a PHP program to display Fibonacci series.
4. Write a PHP Program to read the employee details.
5. Write a PHP program to prepare the student marks list.
6. Write a PHP program to generate the multiplication of two matrices.
7. Create student registration form using text box, check box, radio button, select, submit button. And display user inserted value in new PHP page.
8. Create Website Registration Form using text box, check box, radio button, select, submit button. And display user inserted value in new PHP page.
9. Write PHP script to demonstrate passing variables with cookies.
10. Write a program to keep track of how many times a visitor has loaded the page.
11. Write a PHP application to add new Rows in a Table.
12. Write a PHP application to modify the Rows in a Table.
13. Write a PHP application to delete the Rows from a Table.
14. Write a PHP application to fetch the Rows in a Table.
15. Develop an PHP application to implement the following Operations

     i.   Registration of Users.
     ii.   Insert the details of the Users.
     iii. Modify the Details.
     iv.   Transaction Maintenance.
          a) No of times Logged in
          b) Time Spent on each login.
          c) Restrict the user for three trials only.
          d) Delete the user if he spent more than 100 Hrs of transaction.

16. Write a PHP script to connect MySQL server from your website.
17. Write a program to read customer information like cust-no, cust-name, item- purchased, and mob-no, from customer table and display all these information in table format on output screen.
18. Write a program to edit name of customer to "Kiran" with cust-no =1, and to delete record with cust-no=3.
19. Write a program to read employee information like emp-no, emp-name, designation and salary from EMP table and display all this information using table format in your website.
20. Create a dynamic web site using PHP and MySQL.

MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - **V** (Skill Enhancement Course - Elective)
Course 7A: Web Applications Development using PHP& MYSQL

Time: 3Hrs   Max.marks:75

Section - A

Answer any FIVE question   5X5 = 25M

1. Write about Data types in PHP.

2. Explain about variable Scope.

3. Write about Array related functions.

4. Explain about formatting strings with PHP.

5. Write about setting a Cookie with PHP.

6. Explain about validating files.

7. Write about image creation process.

8. Write about MySQL Versus MySQLi Functions.

Section - B

Answer ALL following question   5X10 = 50M

9. a) Explain about different Loops in PHP?

(or)

   b) Explain about user defined functions.

10. a) Explain about Object Instance working with Strings.

(or)

   b) Explain about Date and Time functions in PHP.

11 a) Explain about Sending Mail on Form Submission.

(or)

   b) Explain about Working with session variables and passing session IDs in the Query String.

12 a) Explain about reading from a file and appending to file.

(or)

   b) Explain how to modify existing images.

13 a) Explain about connecting to MySQL with PHP.

(or)

   b) Explain about Record Addition and Record Deletion mechanisms.

B Sc	Semester :V(Skill Enhancement Course - Elective)	Credits: 4
Course: 6B	**Internet of Things**	Hrs/Wk: 4

Learning Outcomes: Students after successful completion of the course will be able to:
1. Appreciate the technology for IoT
2. Understand various concepts, terminologies and architecture of IoT systems.
3. Understand various applications of IoT
4. Learn how to use various sensors and actuators for design of IoT.
5. Learn how to connect various things to Internet.
6. Learn the skills to develop simple IOT Devices.

Syllabus: *(Total Hours: 90 including Teaching, Lab, Field training, Unit tests etc.)*

UNIT I: (10 hours)
Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M.

Applications of IoT: Home Automation, Smart Cities, Energy, Retail Management, Logistics, Agriculture, Health and Lifestyle, Industrial IoT, Legal challenges, IoT design Ethics, IoT in Environmental Protection.

UNIT II: (10 hours)
Sensors Networks : Definition, Types of Sensors, Types of Actuators, Examples and Working, IoT Development Boards: Arduino IDE and Board Types, RaspberriPi Development Kit, RFID Principles and components, Wireless Sensor Networks: History and Context, The node, Connecting nodes, Networking Nodes, WSN and IoT.

UNIT III: (10 hours)
Wireless Technologies for IoT: WPAN Technologies for IoT: IEEE 802.15.4, Zigbee, HART, NFC, Z-Wave, BLE, Bacnet And Modbus. IP Based Protocols for IoT IPv6, 6LowPAN, LoRA, RPL, REST, AMPQ, CoAP, MQTT.Edge connectivity and protocols.

UNIT IV: (10 hours)
Arduino Simulation Environment: Arduino Uno Architecture, Setting up the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD.

Sensor & Actuators with Arduino: Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensors with Arduino, Interfacing of Actuators with Arduino, Interfacing of Relay Switch and Servo Motor with Arduino.

UNIT V: (10 hours)
Developing IOT's: Implementation of IoT with Arduino, Connecting and using various IoT Cloud Based Platforms such as Blynk, Thingspeak, AWS IoT, Google Cloud IoT Core etc. Cloud Computing, Fog Computing, Privacy and Security Issues in IoT.

REFERENCES:

1. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1st Edition, VPT, 2014
3. Daniel Minoli, ― "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
4. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
5. Open source software / learning websites

   a. https://github.com/connectIOT/iottoolkit
   b. https://www.arduino.cc/
   c. https://onlinecourses.nptel.ac.in/noc17_cs22/course
      d. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html
      e. Contiki (Open source IoT operating system)
   f. Ardudroid (open source IoT project)
   g. https://blynk.io (Mobile app)
   h. IoT Toolkit (smart object API gateway service reference implementation)

6. Other web sources suggested by the teacher concerned and the college librarian including reading material.

Co-Curricular Activities:

a) **Mandatory:** *(Training of students by teacher in field related skills: (lab: 10 + field: 05) :*
1. **For Teacher**: Field related training of students by the teacher in laboratory/field for not less than 15 hours on identifying the case study for the IoT, design an IoT solution, build physical IoT device, connect it to a mobile app and deploy the IoT device.
2. **For Student**: Students shall (individually) search online and visit any of the places like aquaculture farms, agencies using IOT devices, etc to identify problems for IoT solution and submit a hand-written Fieldwork/Project work/Project work/Project work/Project work Report not exceeding 10 pages. Example: Choosing a Problem for IoT solution (agriculture, aquaculture, smart home appliances, testing moisture levels, oxygen levels, etc), reasons why IoT solution is feasible for the said problem, material required, Design and architecture for the proposed IoT device, method of implementation and how to connect the device to mobile.
3. Max marks for Fieldwork/Project work/Project work/Project work/Project work/Projectwork Report: 05.
4. Suggested Format for Fieldwork/Project work/Project work/Project work/Project work: *Title page, student details, index page, details of websites searched, place visited, observations, findings, proposed IOT problem, and design of the IOT device, implementation and acknowledgements*.
5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments
3. Preparation and presentation of power-point slides, which include videos, animations, pictures, graphics, etc by the students.
4. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
5. Field visits to identify the problems for IoT solutions.

B Sc	**Semester :V**(Skill Enhancement Course - Elective)	**Credits: 1**
Course: 6B	**Internet of Things Lab**	**Hrs/Wk: 2**

Internet of Things – PRACTICAL SYLLABUS

Learning Outcomes:
  On successful completion of this practical course, student shall be able to:
  1. Acquire the skills to design a small IoT device.
  2. Connect various sensors, actuators, etc to Arduino board.
  3. Connect the things to Internet
  4. Design a small mobile app to control the sensors.
  5. Deploy a simple IoT device.

Practical (Laboratory) Syllabus: *(30 hrs)*

1. Understanding Arduino UNO Board and Components

2. Installing and work with Arduino IDE

3. Blinking LED sketch with Arduino

4. Simulation of 4-Way Traffic Light with Arduino

5. Using Pulse Width Modulation

6. LED Fade Sketch and Button Sketch

7. Analog Input Sketch (Bar Graph with LEDs and Potentiometre)

8. Digital Read Serial Sketch (Working with DHT/IR/Gas or Any other Sensor)

9. Working with Adafruit Libraries in Arduino

10. Spinning a DC Motor and Motor Speed Control Sketch

11. Working with Shields

12. Design APP using Blink App or Things peak API and connect it LED bulb.

13. Design APP Using Blynk App and Connect to Temperature, magnetic Sensors.

MODEL QUESTION PAPER (Sem-end. Exam)

B.Sc DEGREE EXAMINATIONS

Semester - V (Skill Enhancement Course - Elective)

Course 6B: Internet of Things

<u>Time: 3Hrs</u>   <u>Max.marks:75</u>

Section - A

Answer any FIVE question   5X5 = 25M

1. What are the Definitions & Characteristics of IoT.

2. Write about IoT design Ethics.

3. Write about the Types of Sensors.

4. Write about RFID principles and components.

5. Write about Zigbee technology.

6. Explain about IPV6.

7. Write about Arduino Libraries.

8. Write about Fog Computing.

Section - B

Answer ALL following question   5X10 = 50M

9. a) Explain about Physical & Logical Design of IoT.

(or)

   b) Explain about IoT in Environmental Protection.

10. a) Explain about Arduino IDE and Board Types.

(or)

   b) Explain about Connecting nodes and Networking Nodes.

11 a) Explain about Bacnet and Modbus.

(or)

   b) Explain about Edge connectivity and protocols.

12 a) Explain about Arduino Uno Architecture.

(or)

   b) Explain about Interfacing of Actuators with Arduino.

13 a) Explain about Implementation of IoT with Arduino.

(or)

   b) Explain about Privacy and Security Issues in IoT.

B Sc	Semester :V(Skill Enhancement Course - Elective)	Credits: 4
Course: 7B	**Application Development using Python**	Hrs/Wk: 4

Learning Outcomes: Students after successful completion of the course will be able to:

1. Understand and appreciate the web architecture and services.
2. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
3. Demonstrate proficiency in handling Strings and File Systems.
4. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
5. Interpret the concepts of Object-Oriented Programming as used in Python.
6. Apply concepts of Python programming in various fields related to IOT, Web Services and Databases in Python.

Syllabus: *(Total Hours: 90 including Teaching, Lab, Field training, Unit tests etc.)*

UNIT I: (10 hours)
Python basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types
Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules
Sequences - Strings, Lists, and Tuples, Mapping and Set Types

UNIT II: (10 hours)
Files: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules
Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules
Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules

UNIT III: (10 hours)
Regular Expressions: Introduction, Special Symbols and Characters, Res and Python Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

UNIT IV: (10 hours)
GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs
Web Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application, Advanced CGI, Web (HTTP) Servers

UNIT V: (10 hours)

Database Programming: Introduction, Python Database Application Programmer's Interface (DBAPI), Object Relational Managers (ORMs), Related Modules

REFERENCES:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
2. Think Python, Allen Downey, Green Tea Press.
3. Introduction to Python, Kenneth A. Lambert, Cengage.
4. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
5. Learning Python, Mark Lutz, O' Really.
6. Web sources suggested by the teacher concerned and the college librarian including reading material.

Co-Curricular Activities:

a) **Mandatory:** *(Training of students by teacher in field related skills: (lab: 10 + field: 05)*
   1. **For Teacher**: Training of students by the teacher in laboratory/field for not less than 15 hours on field related skills like building an IOT device with the help of Python.
   2. **For Student**: Students shall (individually) identity the method to link their IOT project done in Paper 7A with Python and submit a hand-written Fieldwork/Project work/Project work/Project work/Project work Report not exceeding 10 pages. It should include a brief report on the selected case study of IOT device, algorithm and Python program to operate the IOT device.
   3. Max marks for Fieldwork/Project work/Project work/Project work/Project work/Projectwork Report: 05.
   4. Suggested Format for Fieldwork/Project work/Project work/Project work/Project work: *Title page, student details, index page, design of the IOT device, implementation of Python program to connect the IOT device, findings and acknowledgements.*
   5. Unit tests (IE).

b) Suggested Co-Curricular Activities
   1. Training of students by related industrial experts.
   2. Assignments
   3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
   4. Presentation by students on best websites.

B Sc	**Semester :V**(Skill Enhancement Course - Elective)	**Credits: 1**
Course: 7B	**Application Development using Python Lab**	**Hrs/Wk: 2**

Application Development Using Python– PRACTICAL SYLLABUS

Learning Outcomes:

On successful completion of this practical course, student shall be able to:

1. Implement simple programs in Python
2. Implement programs related to various data structures like lists, dictionaries, etc.
3. Implement programs related to files.
4. Implement applications related to databases, Web services and IOT.

Practical (Laboratory) Syllabus: *(30 hrs.)*

1. Write a menu driven program to convert the given temperature from Fahrenheit toCelsius and vice versa depending upon user's choice.

2. Write a python program to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign gradesaccording to the following criteria :
   Grade A: Percentage >=80
   Grade B: Percentage>=70 and
   <80 Grade C: Percentage>=60
   and   <70   Grade   D:
   Percentage>=40 and <60 Grade
   E: Percentage<40

3. Write a python program to display the first n terms of Fibonacci series.

4. Write a python program to calculate the sum and product of two compatible matrices.

5. Write a function that takes a character and returns True if it is a vowel and False otherwise.

6. Write a menu-driven program to create mathematical 3D objects
   I.   curve
   II.   sphere
   III.   cone
   IV.   arrow
   V.   ring
   VI.   Cylinder.

7. Write a python program to read n integers and display them as a histogram.

8. Write a python program to display sine, cosine, polynomial and exponential curves.

9. Write a python program to plot a graph of people with pulse rate p vs. height h. Thevalues of P and H are to be entered by the user.

10. Write a python program to calculate the mass m in a chemical reaction. The mass

m (in gms) disintegrates according to the formula m=60/ (t+2), where t is the time in hours. Sketch a graph for t vs. m, where t>=0.

11. A population of 1000 bacteria is introduced into a nutrient medium. The population pgrows as follows:

$$P (t) = (15000(1+t))/ (15+ e)$$

12. Where the time t is measured in hours. WAP to determine the size of the population atgiven time t and plot a graph for P vs t for the specified time interval.

13. Input initial velocity and acceleration, and plot the following graphs depicting equations of motion:
    VII. velocity wrt time (v=u+at)
    VIII. distance wrt time (s=u*t+0.5*a*t*t)

    IX. distance wrt velocity (s=(v*v-u*u)/2*a)

14. Write a program that takes two lists and returns True if they have at least one commonmember.

15. Write a Python program to print a specified list after removing the 0th, 2nd, 4th and5th elements.

16. Write a program to implement exception handling.

17. Try to configure the widget with various options like: bg="green", family="times",size=20.

18. Write a Python program to read last 5 lines of a file.

19. Design a simple database application that stores the records and retrieve the same

20. Design a database application to search the specified record from the database.

21. Design a database application to that allows the user to add, delete and modify therecords.

MODEL QUESTION PAPER (Sem-end. Exam)
B.Sc DEGREE EXAMINATIONS
Semester - **V** (Skill Enhancement Course - Elective)
Course 7B: Application Development using Python

Time: 3Hrs   **Max.marks:75**

Section - A

Answer any FIVE question   **5X5 = 25M**

1. Write about Python Objects.
2. Write about Numbers in Python.
3. Write about command-line arguments.
4. Explain how to Import Modules.
5. Write about Special Symbols and Characters.
6. Write about Related modules of GUIs.
7. Write about Web (HTTP) Servers.
8. Write about related modules of Database Programming.

Section - B

Answer ALL following question   **5X10 = 50M**

9. a) Explain about standard type operators.

(or)

   b) Explain about Lists in detail.

10. a) Explain about Persistent Storage Modules

(or)

   b) Explain about Detecting and Handling Exceptions.

11 a) Explain about Threads and the Global Interpreter Lock.

(or)

   b) Explain about Thread Module and Threading Module.

12 a) Explain about Tkinter and Python Programming.

(or)

   b) Explain about Building CGI Application.

13 a) Explain about Python Database Application Programmer's Interface (DBAPI).

(or)

   b) Explain about Object Relational Managers (ORMs).

B Sc	Semester :**V**(Skill Enhancement Course - Elective)	Credits: 4
Course: 6C	**Data science**	Hrs/Wk: 4

Learning Outcomes: Students after successful completion of the course will be able to:

1. Develop relevant programming abilities.
2. Demonstrate proficiency with statistical analysis of data.
3. Develop the ability to build and assess data-based models.
4. Demonstrate skill in data management
5. Apply data science concepts and methods to solve problems in real-world contextsand will communicate these solutions effectively

Syllabus: (*(Total Hours: 90 including Teaching, Lab, Field training, Unit tests etc.)*

UNIT I: (10 hours)

Introduction: The Ascendance of Data, What is Data Science? , Finding key Connectors, Data Scientists You May Know, Salaries and Experience, Paid Accounts, Topics of Interest, Onward.

Python: Getting Python, The Zen of Python, Whitespace Formatting, Modules, Arithmetic, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Generators and Iterators, Randomness, Object – Orienting Programming, Functional Tools, enumerate, zip and Argument Unpacking, args and kwargs, Welcome to Data Sciencester!

Visualizing Data: matplotlib, Bar charts, Line charts, Scatterplots.

Linear Algebra: Vectors, Matrices

UNIT II: (10 hours)

Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, some Other Correlation Caveats, Correlation and Causation.

Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem.

Hypothesis and Inference: Statistical Hypothesis Testing, Example: Flipping a Coin, Confidence Intervals, P-hacking, Example: Running an A/B Test, Bayesian Inference.

Gradient Descent: The Idea behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Putting It All Together, Stochastic Gradient Descent.

UNIT III: (10 hours)

Getting Data: stdin and stdout, Reading Files – The Basics of Text Files, Delimited Files, Scraping the Web - HTML and the parsing Thereof, Example: O'Reilly Books About Data, Using APIs – JSON (and XML), Using an Unauthenticated API, Finding APIs.

Working with Data: Exploring Your Data, Exploring One-Dimensional Data, Two Dimensions Many Dimensions, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

Machine Learning: Modeling, What Is Machine Learning? Over fitting and under fitting, Correctness, The Bias-Variance Trade-off, Feature Extraction and Selection

UNIT IV: (10 hours)

K-Nearest Neighbors: The Model, Example: Favorite Languages, The Curse of Dimensionality.

Naive Bayes: A Really Dumb Spam Filter, A More Sophisticated Spam Filter,Implementation, Testing Our Model.

Simple Linear Regression: The Model, Using Gradient Descent, Maximum Likelihood Estimation.

Multiple Regression: The Model, Further Assumptions of the Least Squares Model, Fittingthe Model, Interpreting the Model, Goodness of Fit.

UNIT V: (10 hours)

Logistic Regression: The Problem, The Logistic Function, Applying the Model, Goodness of Fit Support Vector Machines.

Decision Trees: What Is a Decision Tree? Entropy, The Entropy of a Partition, Creating a Decision Tree, Putting It All Together, Random Forests.

Neural Networks: Perceptron, Feed-Forward Neural Networks And Back propagation,Example: Defeating a CAPTCHA.

Clustering: The Idea, The Model, Example: Meetups , Choosing k, Example: Clustering Colors, Bottom-up Hierarchical Clustering.

REFERENCES:

1. Data Science from Scratch by Joel Grus O'Reilly Media
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 2nd Edition, 2018.
3. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.
4. Web resources:
   a. https://www.edx.org/course/analyzing-data-with-python
   b. http://math.ecnu.edu.cn/~lfzhou/seminar/[Joel_Grus]_Data_Science_from_Scratch_First_Princ.pdf
5. 9. Other web sources suggested by the teacher concerned and the college librarian including reading material.

Co-Curricular Activities:

a) **Mandatory:** *(Training of students by teacher in field related skills: (lab:10 + field: 05):*

1. **For Teacher**: Field related training of students by the teacher in laboratory/field for not less than 15 hours on identifying, analyzing and presenting the data and then to predict the future instances.
2. **For Student**: Students shall (individually) search online and visit any of the agencies like Statistical cell, weather forecasting centers, pollution control boards, manufacturing industries, agriculture departments, etc. to observe the manual process going on to collect the data, maintain the data, present the data and to predict the data for future instances and submit a hand-written Fieldwork/Project work/Project work/Project work/Project work Report not exceeding 10 pages.
3. Max marks for Fieldwork/Project work/Project work/Project work/Project work/Projectwork Report: 05.

4. Suggested Format for Fieldwork/Project work/Project work/Project work/Project work: *Title page, student details, index page, details of place visited, observations, findings andacknowledgements.*
5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.
2. Assignments
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Presentation by students in related topics.

| B Sc	Semester :**V**(Skill Enhancement Course - Elective)	Credits: 1
Course: 6C	**Data science Lab**	Hrs/Wk: 2

Course 6C: Data Science – PRACTICAL SYLLABUS

Learning Outcomes: On successful completion of this practical course, student shall beable to:
1. Apply data science solutions to real world problems.
2. Implement the programs to get the required data, process it and present the outputs using Python language.
3. Execute statistical analyses with Open source Python software.

Practical (Laboratory) Syllabus: *(30 hrs.)*
1. Write a Python program to create a line chart for values of year and GDP as givenbelow
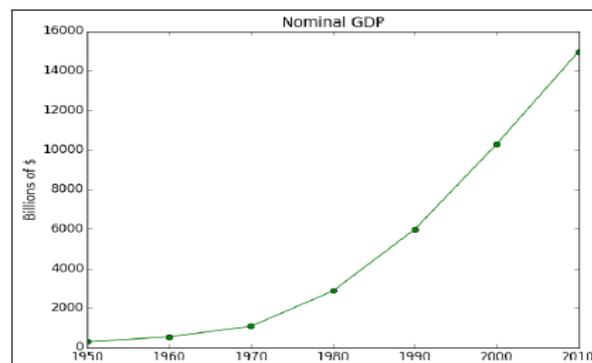
2. Write a Python program to create a bar chart to display number of students secureddifferent grading as given below
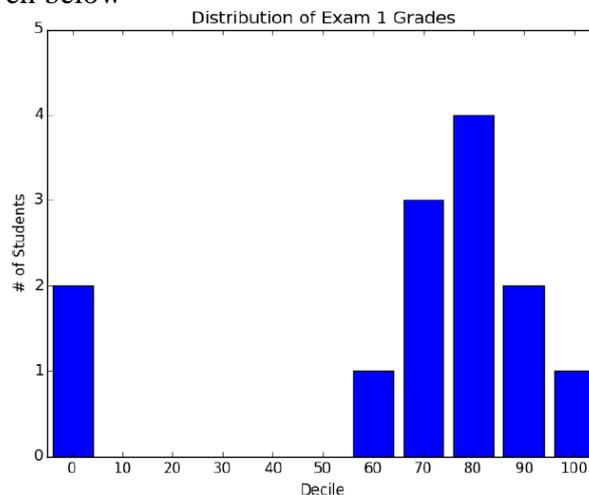
3. Write a Python program to create a time series chart by taking one year month wisestock data in a CSV file
4. Write a Python program to plot distribution curve
5. Import a CSV file and perform various Statistical and Comparison operations on rows/columns. Write a python program to plot a graph of people with pulse rate p vs.height h. The values of P and H are to be entered by the user.
6. Import rainfall data of some location with the help of packages available in R Studioand plot a chart of your choice.

MODEL QUESTION PAPER (Sem-end. Exam)

B.Sc DEGREE EXAMINATIONS

Semester - V (Skill Enhancement Course - Elective)

Course 6C: Data science

Time: 3Hrs   **Max.marks:75**

Section - A

Answer any FIVE question   5X5 = 25M

1. Write about Finding key Connectors.

2. Write about matplotlib.

3. Write about Simpson's Paradox.

4. Explain about Bayes's Theorem.

5. Write about The Basics of Text Files and Delimited Files.

6. Write about Rescaling, Dimensionality Reduction.

7. Write about Maximum Likelihood Estimation.

8. Write about Random Forests.

Section - B

Answer ALL following question   5X10 = 50M

9. a) Explain about Lists and Dictionaries.

(or)

   b) Explain about Vectors and Matrices.

10. a) Explain about Correlation and Causation.

(or)

    b) Explain about Statistical Hypothesis Testing.

11 a) Explain about Using an Unauthenticated API and finding APIs.

(or)

   b) Explain about Feature Extraction and Selection.

12 a) Explain about Naive Bayes model.

(or)

   b) Explain about Multiple Regression model.

13 a) Explain about Logistic Regression model.

(or)

   b) Explain about Bottom-up Hierarchical Clustering.

B Sc	Semester :V(Skill Enhancement Course - Elective)	Credits: 4
Course: 7C	Python for Data science	Hrs/Wk: 4

Learning Outcomes: Students after successful completion of the course will be able to:

1. Identify the need for data science and solve basic problems using Python built-in data types and their methods.
2. Design an application with user-defined modules and packages using OOP concept
3. Employ efficient storage and data operations using NumPy arrays.
4. Apply powerful data manipulations using Pandas.
5. Do data pre-processing and visualization using Pandas

Syllabus: *(Total Hours: 90 including Teaching, Lab, Field training, Unit tests etc.)*

UNIT I: (10 hours)
Introduction to Data Science - Why Python? - Essential Python libraries - Python Introduction-Features, Identifiers, Reserved words, Indentation, Comments, Built-in Data types and their Methods: Strings, List, Tuples, Dictionary, Set - Type Conversion- Operators. Decision Making- Looping- Loop Control statement- Math and Random number functions. User defined functions - function arguments & its types.

UNIT II: (10 hours)
User defined Modules and Packages in Python- Files: File manipulations, File and Directory related methods - Python Exception Handling. OOPs Concepts -Class and Objects, Constructors – Data hiding- Data Abstraction-Inheritance.

UNIT III: (10 hours)
NumPy Basics: Arrays and Vectorized Computation- The NumPy ndarray- Creating ndarrays-Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing - Boolean Indexing-Transposing Arrays and Swapping Axes.
Universal Functions: Fast Element-Wise Array Functions- Mathematical and Statistical Methods-Sorting- Unique and Other Set Logic.

UNIT IV: (10 hours)
Introduction to pandas Data Structures: Series, Data Frame and Essential Functionality: Dropping Entries- Indexing, Selection, and Filtering- Function Application and Mapping-Sorting and Ranking.
Summarizing and Computing Descriptive Statistics- Unique Values, Value Counts, and Membership. Reading and Writing Data in Text Format

UNIT V: (10 hours)
Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers- String Manipulation: Vectorized String Functions in pandas.
Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots.

REFERENCES:

1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson, 2012.
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 2nd Edition, 2018.
3. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.
4. Wesley J. Chun, "Core Python Programming", Prentice Hall, 2006.
5. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009.
6. Web resources:
    a. https://www.edx.org/course/python-basics-for-data-science
    b. https://www.edx.org/course/analyzing-data-with-python
    c. https://www.coursera.org/learn/python-plotting?specialization=data-science-python
    d. https://www.programmer-books.com/introducing-data-science-pdf/
    e. https://www.cs.uky.edu/~keen/115/Haltermanpythonbook.pdf
7. Other web sources suggested by the teacher concerned and the college librarian including reading material.

Co-Curricular Activities:

a) **Mandatory:** *(Training of students by teacher in field related skills: (lab:10 + field: 05):*
 1. **For Teacher**: Field related training of students by the teacher in laboratory/field for not less than 15 hours on collecting the data, analyzing the data and presenting the data using Python language with some real time data.
 2. **For Student**: Students shall (individually) visit any of the agencies like Agriculture dept, statistical cell, irrigation department, Ground water department, CPO office, Rural Water Supply and Sanitation department etc or search online to get real time data like Aids database, weather forecasting database, social networking data, etc and identify any one database, implement and present the necessary charts in Python language and submit a hand- written Fieldwork/Project work/Project work/Project work/Project work Report not exceeding 10 pages. Example: Identifying a database, get the data, present the data inrequired charts and to predict the future instances if possible.
 3. Max marks for Fieldwork/Project work/Project work/Project work/Project work Report:05.
 4. Suggested Format for Fieldwork/Project work/Project work/Project work/Project work: *Title page, student details, index page, and details of place visited, observations, method of data collection, database identified, and implementation in Python language, other findingsand acknowledgements*.
 5. Unit tests (IE).

b) **Suggested Co-Curricular Activities**
 1. Training of students by related industrial experts.
 2. Assignments
 3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
 4. Presentation by students on the topics within and outside the syllabus.

B Sc	Semester :V(Skill Enhancement Course - Elective)	Credits: 1
Course: 7C	Python for Data science Lab	Hrs/Wk: 2

Python for Data Science – PRACTICAL SYLLABUS

Learning Outcomes: On successful completion of this practical course, student shall beable to:

1. Implement simple programs in Python.
2. Implement programs related to various structures like arrays, lists, Data frames, etc.
3. Implement programs related to files.
4. Implement applications related to data science.

Practical (Laboratory) Syllabus: *(30 hrs.)*

1. Perform Creation, indexing, slicing, concatenation and repetition operations onPython built-in data types: Strings, List, Tuples, Dictionary, Set
2. Apply Python built-in data types: Strings, List, Tuples, Dictionary, Set and theirmethods to solve any given problem.
3. Handle numerical operations using math and random number functions
4. Create user-defined functions with different types of function arguments.
5. Create packages and import modules from packages.
6. Perform File manipulations- open, close, read, write, append and copy from onefile to another.
7. Write a program for Handle Exceptions using Python Built-in Exceptions
8. Write a program to implement OOP concepts like Data hiding and DataAbstraction.
9. Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects andRandom Functions.
10. Manipulation of NumPy arrays- Indexing, Slicing, Reshaping, Joining andSplitting.
11. Computation on NumPy arrays using Universal Functions and Mathematicalmethods.
12. Load an image file and do crop and flip operation using NumPy Indexing.
13. Create Pandas Series and Data Frame from various inputs.
14. Import any CSV file to Pandas Data Frame and perform the following:
    (a) Visualize the first and last 10 records
    (b) Get the shape, index and column details
    (c) Select/Delete the records (rows)/columns based on conditions.
    (d) Perform ranking and sorting operations.
    (e) Do required statistical operations on the given columns.
    (f) Find the count and uniqueness of the given categorical values.
    (g) Rename single/multiple columns

15. Import any CSV file to Pandas Data Frame and perform the following:
    (a) Handle missing data by detecting and dropping/ filling missing values.
    (b) Transform data using apply () and map() method.
    (c) Detect and filter outliers.
    (d) Perform Vectorized String operations on Pandas Series.
    (e) Visualize data using Line Plots, Bar Plots, Histograms, Density Plotsand Scatter Plots.

MODEL QUESTION PAPER (Sem-end. Exam)

B.Sc DEGREE EXAMINATIONS

Semester - V (Skill Enhancement Course - Elective)

Course 7C: Python for Data science

<u>**Time: 3Hrs**</u>   <u>**Max.marks:75**</u>

Section - A

Answer any FIVE question   **5X5 = 25M**

1. Write about essential Python libraries.

2. Write about Indentation and Comments in Python.

3. Write about File manipulations

4. Explain about Data Abstraction.

5. Write about Data Types for ndarrays.

6. Write about Element-Wise Array Functions.

7. Write about Dropping Entries.

8. Write about Handling Missing Data.

Section - B

Answer ALL following question   **5X10 = 50M**

9. a) Explain about Loop Control statement

(or)

   b) Explain about function arguments & its types.

10. a) Explain about Python Exception Handling.

(or)

   b) Explain about Inheritance in Python.

11 a) Explain about Transposing Arrays and Swapping Axes.

(or)

   b) Explain about Mathematical and Statistical Methods

12 a) Explain about Sorting and Ranking.

(or)

   b) Explain about Reading and Writing Data in Text Format.

13 a) Explain about Detecting and Filtering Outliers.

(or)

   b) Explain about Histograms and Density Plots.