Bachelor of Computer Applications (BCA)

New Syllabus

w. e. f. 2020-21

Prepared
By
Krishna University

Chairman of the Committee
Prof. Y. K. SundaraKrishna

Syllabus of Bachelor of Computer Applications (BCA)

w. e. f 2020-21.

COURSE STRUCTURE

S.No		Semester	Hours/ Week	No of Credits	Max. Marks Internal assessment	Max. Marks University Exam	Total Marks
1		I	30	25	125	625	750
2		II	32	27	125	675	800
3		III	32	27	125	675	800
4		IV	36	30	150	750	900
5		V	36	30	150	750	900
#6		VI					
#Total			166	139	675	3475	4150

 # To be finalized

I Semester

S.No	Paper Code	Subject	Hours/ Week	No of Credits	Max. Marks Internal assessment	Max. Marks University Exam	Total Marks
1.		English – I	4	3	25	75	100
2.		Language(H/T/S) – I	4	3	25	75	100
3.		Life Skill Course – I	2	2	-0-	50	50
4.		Skill Development Course – I	2	2	-0-	50	50
5.	C1	Computer Fundamentals & Office tools	4	4	25	75	100
	C1-P	Computer Fundamentals & Office tools-Lab	2	1	-0-	50	50
6	C2	Programming in C	4	4	25	75	100
	C2-P	Programming in C Lab	2	1	-0-	50	50
7.	C3	Numerical and Statistical Methods	4	4	25	75	100
	C3-P	Numerical and Statistical Methods-Lab	2	1	-0-	50	50
Total			30	25	125	625	750

II Semester

S.No	Paper Code	Subject	Hours/ Week	No of Credits	Max. Marks Internal assessment	Max. Marks University Exam	Total Marks
1.		English – II	4	3	25	75	100
2.		Language(H/T/S) – II	4	3	25	75	100
3.		Life Skill Course – II	2	2	-0-	50	50
4.		Skill Development Course – II	2	2	-0-	50	50
5.		Skill Development Course – III	2	2	-0-	50	50
6.	C4	Data Structures	4	3	25	75	100
	C4-P	Data Structures Lab	2	2	-0-	50	50
7.	C5	Object Oriented Analysis & Design	4	3	25	75	100
	C5-P	Object Oriented Analysis & Design Lab	2	2	-0-	50	50
8.	C6	Database Management Systems	4	3	25	75	100
	C6-P	Database Management Systems Lab	2	2	-0-	50	50
Total			32	27	125	675	800

III Semester

S.No	Paper Code	Subject	Hours/ Week	No of Credits	Max. Marks Internal assessment	Max. Marks University Exam	Total Marks
1.		English –III	4	3	25	75	100
2.		Language(H/T/S) – III	4	3	25	75	100
3.		Life Skill Course – III	2	2	-0-	50	50
4.		Life Skill Course – IV	2	2	-0-	50	50
5.		Skill Development Course – IV	2	2	-0-	50	50
6.	C7	Accounting and Financial Management	4	3	25	75	100
	C7-P	Accounting and Financial Management Lab	2	2	-0-	50	50
7.	C8	Object Oriented Programming Through Java	4	3	25	75	100
	C8-P	Object Oriented Programming Through Java Lab	2	2	-0-	50	50
8.	C9	Operating Systems	4	3	25	75	100
	C9-P	Operating Systems Lab	2	2	-0-	50	50
Total			32	27	125	675	800

IV Semester

S. No	Paper Code	Subject	Hours/ Week	No of Credits	Max. Marks Internal assessment	Max. Marks University Exam	Total Marks
1.	C10	Cyber Laws	4	3	25	75	100
	C10-P	Cyber Laws Lab	2	2	-0-	50	50
2.	C11	Data Mining and Data Warehousing	4	3	25	75	100
	C11-P	Data Mining and Data Warehousing Lab	2	2	-0-	50	50
3.	C12	Web Programming	4	3	25	75	100
	C12-P	Web Programming Lab	2	2	-0-	50	50
4.	C13	Design of Object Oriented Applications	4	3	25	75	100
	C13-P	Design of Object Oriented Applications Lab	2	2	-0-	50	50
5.	C14	Data Analytics using R	4	3	25	75	100
	C14-P	Data Analytics using R Lab	2	2	-0-	50	50
6.	C15	Object Oriented Software Engineering	4	3	25	75	100

	C15-P	Object Oriented Software Engineering Lab	2	2	-0-	50	50
Total			36	30	150	750	900

V Semester

S. No	Paper Code	Subject	Hours/ Week	No of Credits	Max. Marks Internal assessment	Max. Marks University Exam	Total Marks
1.	SEC1		4	3	25	75	100
	SEC1-P		2	2	-0-	50	50
2.	SEC2		4	3	25	75	100
	SEC2-P		2	2	-0-	50	50
3.	SEC3		4	3	25	75	100
	SEC3-P		2	2	-0-	50	50
4.	SEC4		4	3	25	75	100
	SEC4-P		2	2	-0-	50	50
5.	SEC5		4	3	25	75	100
	SEC5-P		2	2	-0-	50	50
6.	SEC6		4	3	25	75	100
	SEC6-P		2	2	-0-	50	50
Total			36	30	150	750	900

Semester-I

Computer Fundamentals and Office Tools

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
I	C1	Computer Fundamentals and Office Tools	4	60	4

Course Objectives:

- To introduce the concepts of computer fundamentals and their applications for the efficient use of office technology in a business environment.
- To introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software.
- To provide hands-on use of Word, Excel and PowerPoint.

Course Outcomes:

- Describe the usage of computers and why computers are essential components in business and society.
- Identify categories of programs, system software and applications. Organize and work with files and folders.
- Compose, format and edit a word document and working with macros.
- Create work sheets and using various functions.
- Make presentations and inserting multimedia in them.

Syllabus

UNIT – I

Introduction: Characteristics of Computer, The evolution of Computers, The Computer Generations.
Basic Computer Organization: Input Unit, Output Unit, Storage Unit, Arithmetic Logic Unit, Control Unit, Central Processing Unit.
Secondary Storage Devices: Magnetic Disk, Optical Disk. Magneto optical Disk, Mass Storage Devices, Flash Driveand Other related Concepts.

UNIT – II

Computer Software: Types of Software, Logical systems Architecture, Acquiring Software, Software developmental Steps, Software Engineering.
Computer Languages: Machine Language, Assembly Language, High Level Language, Some High Level Languages, Characteristics of good Programming Language.
Operating Systems: What is an Operating System, Process Management, Some Popular Operating Systems.

UNIT –III

MS-Word: Features of MS-Word, MS-Word Windowcomponents, working with formatted text, Shortcut keys, Formatting documents: Selecting text, Copying & moving data, Formatting characters, changing cases, Paragraph formatting, Indents, Drop Caps, Using format painter, Page formatting, Header & footer, Bullets & numbering, Tabs, Forming tables. Finding &replacing text, go to (F5) command, proofing text (Spell check, Auto correct), Reversing actions, Macros, Inserting pictures, Hyperlinks, Mail merging, Printing documents.

UNIT IV

MS-Excel: Excel Features, Spreadsheets, workbooks, creating, saving & editing a workbook, Renaming sheet, cell entries (numbers, labels, and formulas), spell check, find and replace, Adding and deleting rows and columns Filling series, fill with drag, data sort, Formatting worksheet, Functions and its parts, Some useful Functions in excel (SUM, AVERAGE, COUNT, MAX, MIN, IF), Cell referencing (Relative, Absolute, Mixed), What-if analysis Introduction to charts: types of charts, creation of charts, printing a chart, printing worksheet.

UNIT V

MS-PowerPoint: Features of PowerPoint, Uses, components of slide, templates and wizards, using template, choosing an auto layout, using outlines, adding subheadings, editing text, formatting text, using master slide, adding slides, changing color scheme, changing background and shading, adding header and footer, adding clip arts and auto shapes. Various presentation, Working in slide sorter view (deleting, duplicating, rearranging slides), adding transition and animations to slide show, inserting music or sound on a slide, viewing slide show, Printing slides.

Text Books:
Computer Fundamentals – Pradeep .K.Sinha: BPB Publications.
Fundamentals of Computers -ReemaThareja, Oxford University Press India

References:
Fundamentals of Computers – V. Rajaraman, Prentice Hall of India
Introduction to Computers – Peter Norton Mcgraw Hill.

Computer Fundamentals and Office Tools Lab

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
I	C1-P	Computer Fundamentals and Office Tools Lab	2	30	1

List of Experiments

1) Design a visiting card for managing director of a company as per the following specification.
   - Size of visiting card is 3 ½ ×2
   - Name of the company with big font
   - Phone number, Fax number and E-mail address with appropriate symbols.
   - Office and Residence address separated by a line

2) Create a table with following columns and display the result in separate cells for the following
   - Emp Name, Basic pay, DA, HRA, Total salary.
   - Sort all the employees in ascending order with the name as the key
   - Calculate the total salary of the employee
   - Calculate the Grand total salary of the employee
   - Find highest salary and
   - Find lowest salary

3) Prepare an advertisement to company requiring software professional with the following
   - Attractive page border
   - Design the name of the company using Word Art
   - Use at least one clipart.
   - Give details of the company (use bullets etc)
   - Give details of the Vacancies in each category of employee's (Business manager, Software engineers, System administrators, Programmers, Data entry operators) qualification required.

4) Create a letterhead of a company with the following specifications
   - Name of the company on the top of the page 2 with big font and good style
   - Phone no, Fax no and E-mail address with symbols.
   - Main products manufactured by the company
   - Slogans if any should be specify in bold at the bottom

5) Create two pages of curriculum vitae of a graduate with the following specifications
   - Table to show qualifications with proper headings
   - Appropriate left and right margins
   - Format ½ page using two-column approach about your self
   - Name on each page at the top right side
   - Page no. in the footer on the right side.

6) Write a macro format document as below
   - Line spacing "2" (double)
   - Paragraph indent of 0.1

- o Justification formatting style
- o Arial font and Bold of 14 pt-size

7) Create a letter as the main document and create 10 records for the 10 persons use mail merge
to create letter for selected persons among 10.

8) Create an electronic spread sheet in which you enter the following decimal numbers and convert them into octal, Hexadecimal and binary numbers and vice-versa.

Decimal Numbers: 35,68,95,78,165,225,355,375,465
Binary Numbers: 101,1101,11101,11111,10001,11101111

9) Calculate the net pay of the employees following the conditions below.

	A	B	C	D	E	F	G	H	I
1	Employee Number	Employee name	Basic pay	DA	HRA	GPF	Gross pay	Income tax	Net pay
2									

DA: - 56% of the basic pay if Basic pay is greater than 20000 or else 44%.
HRA: - 15% of the Basic pay subject to maximum of Rs.4000.
GPF: - 10% of the basic pay.
INCOME TAX: - 10% of basic if Basic pay is greater than 20000.
Find who is getting highest salary & who is get lowest salary?

10) The ABC Company shows the sales of different product For 5 years. Create BAR Graph, 3D and Pie chart for the following.

A	B	C	D	E	F
S.No.	Year	Pro 1	Pro 2	Pro 3	Pro 4
1	1989	1000	800	900	1000
2	1990	800	80	500	900
3	1991	1200	190	400	800
4	1992	400	200	300	1000
5	1993	1800	400	400	1200

11) Create a suitable examination database and find the sum of the marks (total) of each student and respective, class secured by the student.
Pass: if marks in each subject >=35
Distinction: if average >=75
First class: if average >=60 but <75
Second class: if average >=50 but less than 60
Third class: if average>=35 but less than 50
Fail: if marks in any subject <35

12) Enter the following data into the sheet.

Name	Department	Salary
Anusha	Accounts	12000
Rani	Engineering	24000
Lakshmi	Accounts	9000
Purnima	Marketing	20000
Bindu	Accounts	4500
Tejaswi	Accounts	11000
Swetha	Engineering	15000
Saroja	Marketing	45000
Sunitha	Accounts	5600
Sandhya	Engineering	24000
Harika	Marketing	8000

- o   Extract records for department in Accounts and Salary >10000
- o   Sort the data by salary with the department using "sort commands".
- o   Calculate total salary for each department using Subtotals

13) Enter the following data into the sheet.

	Raju	Rani	Mark	Rosy	Ismail	Reshma
English	76	89	43	51	76	87
2nd Lang	55	85	78	61	47	33
Maths	65	82	34	58	52	65
Computers	45	91	56	72	49	56
Human Values	51	84	54	64	32	64

Apply the conditional formatting for marks

- 35 below Red
- 35 to 50 Blue
- 51 to 70 Green
- 71 to 100 Yellow

14) Create a presentation using templates.
15) Create a Custom layout or Slide Master for professional presentation.
16) Create a presentation with slide transitions and animation effects.
17) Create a table in PPT and apply graphical representation on it.

PROGRAMMING IN C

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
I	C2	PROGRAMMING IN C	4	60	4

Course Objectives:

- Provides knowledge on Algorithms, Flow chart and different programming languages.
- To train the students with basic concepts of programming using C.
- Provides complete knowledge of C language.
- Helps to develop logics which will help them to create program and applications in C.
- Learning the basic programming constructs, they can easily switch over to any other language in future.

Course Outcomes:

Upon successful completion of this course, students will be able to-
- Understand the basic terminology used in computer programming.
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.
- Understand the dynamics of memory by the use of pointers and Structures.
- Apply different operations in File handling.

Syllabus

UNIT - I:
Introduction to Algorithms and Programming Languages: Algorithm - Key features of Algorithms - examples of Algorithms,Flow Charts– Pseudo code, Programming Languages – Generation of Programming Languages – Structured Programming Language.**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, Type Conversion and Type Casting.

UNIT - II:
Control Structures and Functions: Decision Control and Looping Statements: Introduction to Decision Control Statements, Conditional Branching Statements, Iterative Statements, Nested Loops, Break and Continue Statement – Goto Statement.**Functions**: Introduction, Using functions – Function declaration/ prototype – Function definition, Function call – Return statement – Passing parameters, Scope of variables, Storage Classes, Recursive functions.

UNIT - III:

Arrays and Strings: *Arrays***:** Introduction, Declaration of Arrays, Accessing elements of the Array – Storing Values in Array, Calculating the length of the Array, Operations that can be performed on Array, One dimensional array, Accessing one dimensional array, Passing one dimensional array to function, Two dimensional Arrays, Accessing two dimensional arrays, Passing two dimensional arrays to functions. *Strings:* Introduction, String Operations using String functions.

UNIT - IV:

Pointers, Structures and Unions: *Pointers:* Understanding Computer Memory – Introduction to Pointers, Declaring Pointer Variable, Pointer Expressions and Pointer Arithmetic – Null Pointers, Passing Arguments to Functions using Pointer, Pointer and Arrays – Passing Array to Function, Memory Allocation in C Programs, Memory Usage – Dynamic Memory Allocation, Drawbacks of Pointers. *Structures*: Introduction to structures, Nested Structures. *Union, and Enumerated Data Types*:Introduction to Union – accessing union elements, Enumerated Data Types.

UNIT – V:

File Handling: *Files***:** Introduction to Files, Using Files in C, Reading Data from Files, Writing Data from Files, Detecting the End-of-file, Error Handling during File Operations.

PRESCRIBED TEXT BOOKS:

Computer Fundamentals and Programming in C by REEMA THAREJA from OXFORD UNIVERSITY PRESS

REFERENCE BOOKS:
1. **E Balagurusamy, COMPUTING FUNDAMENTALS & C PROGRAMMING – Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066909-3.**
2. **Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.**
3. **Henry Mullish&HuubertL.Cooper: The Sprit of C, Jaico Pub, House,1996.**
4. **Teach your C Skills-Kanithker**

PROGRAMMING IN C Lab

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
I	C2-P	PROGRAMMING IN C Lab	2	30	1

List of Experiments

1. Write a C program to calculate the expression: ((a*b)/c)+(a+b-c) .
2. Write a C program to calculate $(a+b+c)^3$.
3. Write a C program to check whether the given number is Prime or Not.
4. Write a C program to find the sum of individual digits of a given number .
5. Program to convert Hours into seconds.
6. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
7. Write a program to check whether given number is Palindrome or Not.
8. Write a C program to check whether a given 3-digit number is Armstrong number or not.
9. Write a C program to print the numbers in triangular form.

   1
   1 2
   1 2 3
   1 2 3 4

10. Program to display number of days in given month using Switch – Case.
11. Write a C program to perform the following:
    i.   Addition of two matrices.
    ii.   Multiplication of two matrices.
12. Write a C program to determine if the given string is a palindrome or not.
13. Write C program to find the factorial of a given integer using recursive function.
14. Write a C program to concatenate two strings using pointers.
15. Write a C program to find the length of string using pointers.
16. Program to display Student Details using Structures.
17. Write a C program to
    i.   Write data into a File.
    ii.   Read data from a File.

NUMERICAL AND STATISTICAL METHODS

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
I	C3	NUMERICAL AND STATISTICAL METHODS	4	60	4

Course Objectives:

- To learn how to perform error analysis for arithmetic operations.
- To demonstrate working of various numerical methods.
- To provide a basic understanding of the derivation and use of methods of interpolation and numerical integration.
- To impart knowledge of various statistical techniques.
- To develop students understanding through laboratory activities to solve problems related to above   stated concepts.

Course Outcomes:

- Skill to choose and apply appropriate numerical methods to obtain appropriate solutions to difficult mathematical problems.
- Ability to apply various statistical techniques such as Measures of Central Tendency and Dispersion.
- Understanding of relationship between variables using the method of Correlation and Fit Analysis.
- Skill to execute programs of various Numerical Methods and Statistical techniques for solving mathematical problems.

Syllabus

UNIT 1: Solution of equations (polynomial and transcendental equations) interval having methods, secant, Regula – Falsi, Newton – Raphson methods, Fixed point Iteration method.

UNIT 2: Solution of system of linear equations: Gauss – Elemination method, Gauss – Jordan, Gauss – Siedel iteration method, LU- Decomposition method, Eigen values and Eigen vectors of a square matrix.

UNIT 3: Interpolation: Forward and backward differences, Newton's forward and backward formula, Lagrange's interpolation and Lagrange's inverse interpolation formula.

Numerical differentiation, integration: Numerical differentiation forward and backward formula, Trapezoidal and Simpsons formulas.

Statistical Methods:

UNIT 4 : Basic concepts and definition of statistics : Mean ,Median , Mode , standard deviation ,coefficient of variation ,skewness and kurtosis ,Karl Pearson Correlation coefficient ,Rank Correlation and illustrated examples .

UNIT 5 : Probability : Basic concepts and definition of probability , Probability axioms , Conditional probability , Addition and Multiplication theorem of probability (Based on set theory concepts) , Bayes theorem , problems and applications .

TEXT BOOKS:

1. Sunil S .Patil Numerical and Statistical Methods EBPB.
2. S.S.Shastry Introductory methods of Numerical Analysis PHI (New Delhi).

REFERENCE BOOKS:
1. Gupta S.C & Kapuram VK Fundamentals of Mathematical Statistics.
2. Numerical Analysis, Sultan Chand & Sons New Delhi.

Numerical and Statistical Methods Lab

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
I	C3-P	Numerical and Statistical Methods Lab	2	30	1

List of Experiments

Unit – 1

1) Find the root of the Equation x x = 1.2 by using Regula - Falsi method.
2) Solve the Equation sin x = 5x – 2 by Iteration method.
3) Apply Newton - Raphson method , to find and approximate root , correct to three decimal places , of the Equation $x^3 - 3x - 5 = 0$, which lies near x = 2 .
4) Find the root of the Equation x sin x + cos x = 0 by using Newton – Raphson method.
5) Find the root of the Equation $x^3 + x -1 = 0$ by Iteration method, given that a root lies near 1.

Unit – 2

1) Solve the system of Equations 3x+y-z = 3 , 2x-8y+z=-5 , x-2y+9z=8 using Gauss – Elimination method.
2) Using Gauss –Jordan method solve the system, 2x+y+z=10, 3x+2y+3z = 18, x+4y+9z=16.
3) Solve the Equations 2x+3y+z=9, x+2y+3z=6, 3x+y+2z=8 by LU – Decomposition method.
4) Solve the system of Equations , 8x-3y+2z=20 , 4x+11y-z=33, 6x+3y+12z=35 by using Gauss- Seidel method.
5) Find the Eigen values & Eigen vectors of a square matrix A=$[8 - 62 - 67 - 42 - 43]$.

Unit – 3
1) Using Newton's forward interpolation formula ,the given table of values ,

X	1.1	1.3	1.5	1.7	1.9
f(x)	0.21	0.69	1.25	1.89	2.61

Obtain the value of f(x) when x = 1.4

2) Using Lagrange's Interpolation formula , find the value of y , corresponding to x = 10

3) from the following table

X	5	6	9	11
Y	12	13	14	16

4) From the following table of values of x & y , obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for x = 1.5

X	1.5	2.0	2.5	3.0	3.5	4.0
Y	3.375	7.0	13.625	24.0	38.875	59.0

5) Evaluate $\int_0^1 x^3 dx$ with five sub-intervals by Trapezoidal rule.

6) Evaluate $\int_0^1 \frac{1}{1+x} dx$ using Simpson's 3/8 rule taking h = 1/6.

Unit – 4

1) Find the Karl Pearson's coefficient of skewnwss for the following data :

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No.of students	10	12	18	25	16	14	8

2) Find Bowley's coefficient of skewness for the following data :

Salary	500-600	600-700	700-800	800-900	900-1000	1000-1100	1100-1200	1200-1300
No.of persons	10	28	40	64	25	18	9	6

3) Find the standard deviation from Assumed mean method for the following data :

Class interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	1	4	17	45	26	5	2

4) Find the coefficient of skewness for the following data :

Variable	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	2	5	7	13	21	16	8	3

5) Find the rank correlation coefficient for the following data:

X 65	45	67	38	48	50	26	47	70	62
Y 64	40	58	46	52	49	38	47	59	60

Unit – 5

1) Three dice are tossed together. Find the probability that exactly two of the three numbers that show on them are equal.

2) What is the probability that a card drawn at random from the pack of playing cards may be either a Queen or a Jack?

3) If two cards are drawn from a well shuffled pack, find the probability that at least one of the two is Hearts.

4) A bag contains 4 Red, 6 Blue balls and a second bag contains 4 Blue & 6 Green balls. A ball is taken out from each bag. Find the probability that one ball is red and the other ball is Green.The probability that an event A happens in one trail of an experiment is 0.4. Three independent trails of the experiment are performed. Find the probability that the event A happens at least once

Semester II
Data Structures

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C4	Data Structures	4	60	4

Course Objectives:

- The objective of the course is to make a student to implement data structures and organize data based on data structures for efficient access.

Course Outcomes:

- Identify data structures suitable to solve problems.
- Developing algorithms.
- Identifying the use of Time and Space Complexity.
- Implementing different sorting & searching techniques.

Syllabus

Unit I

Introduction and Overview- Elementary Data Organization, Data Structures, Data Structure Operations, *Algorithms:* Complexity, Time-Space Tradeoff.

Preliminaries-Mathematical Notation and Functions, Algorithmic Notation, Control Structures, Complexity of Algorithms. Other Asymptotic Notations, Sub algorithms, Variables, Data Types.

Unit II

String Processing – Storing Strings, Character Data Type, String Operations, Word Processing, Pattern Matching Algorithms.

Arrays, Records and Pointers – Linear Arrays, Representation and Traversing Linear Arrays, Inserting and Deleting, Bubble Sort, Linear Search, Binary Search, Multidimensional Arrays, Pointer Arrays, Record Structures, Representation of records in memory, Parallel Arrays, Matrices, Sparse Matrices.

Unit III

Linked Lists – Representation, Traversing, Searching, Memory Allocation: Garbage Collection, Insertion, Deletion, Header Linked Lists, Two-Way Lists

Stacks, Queues, Recursion- Stacks, Array representation, Linked List representation, Arithmetic Expressions; Polish notation, Quick sort, Recursion, Towers of Hanoi,

Implementation of recursive procedures by stacks, Queues, Linked representation of Queues, Dqeques, Priority Queues.

Unit IV

Trees- Binary trees, Representing and traversing binary trees, Traversal algorithms using stacks, Header nodes, Binary Search Trees, Searching, Insertion and Deletion in Binary Search Trees, AVL Search Trees, Insertion and Deletion in AVL trees, m-way search trees, searching, insertion and deletion in m-way search tree, B Trees, searching, insertion and deletion in a B-tree, Heap: Heap Sort, Huffman's Algorithms, General Trees

Unit V

Graphs- Terminology, Sequential representation of Graphs, Warshall's Algorithm, Linked representation of Graphs, Operations on Graphs, Traversing a Graph, Topological Sorting

Sorting and Searching- Insertion Sort, Selection sort, Merging, Merge sort, Radix sort, Searching and Data modification, Hashing

Text books:

1. Data Structures by Seymour Lipschutz, McGraw Hill(Schaum's Outlines).

REFERENCE BOOKS:

1. Data Structures & Algorithms Using C, Khanna Publishers

2. Theory and Problems of Data Structures by Seymour Lipschutz, McGraw Hill (Schaum's Outlines)

3. Data Structures & Algorithms in C by M.A.Weiss, Addison Wisley.

4. Data Structures Using C, Reema Thareja, oxford.

Data Structures Lab

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C4-P	Data Structures Lab	2	30	1

List of Lab Experiments

1. Write a C program to Implement matrix multiplication.
2. Write a C program to Implement stack using arrays.
3. Write a C program to Implement queue using arrays.
4. Write a C program to Implement circular queue using arrays.
5. Write a C program to Implement dequeue using arrays.
6. Write a C program to Implement single linked list using the methods create(), insert(), search(), delete() and display().
7. Write a C program to Implement double linked list.
8. Write a C program to Implement stack using linked list.
9. Write a C program to Implement queue using linked list.
10. Give a solution to towers of Hanoi using C program.
11. Write a C program to Implement bubble sort.
12. Write a C program to Implement selection sort.
13. Write a C program to Implement insertion sort.
14. Write a C program to Implement merge sort.
15. Write a C program to Implement quick sort.

OBJECT ORIENTED ANALYSIS AND DESIGN

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C5	OBJECT ORIENTED ANALYSIS AND DESIGN	4	60	4

Course Objectives:

- To provide a sound understanding of the fundamental concepts and historical evolution of the model.
- To facilitate a mastery of the notation and process of object-oriented analysis and design.

Course Outcomes:

By the end of the course, student will be able to:
- Have Knowledge in evolution and foundations of OO Model and its elements.
- Identify relationship between classes and objects.
- Know importance of classification and can identify classes and objects.
- Have basic knowledge of UML.
- Knowledge in syntax and semantics of UML.

Syllabus

UNIT I:

The Object Model-*The Evolution of the Object Model:* The generations of programming languages, The topology of Programming languages. *Foundations of the Object Model*: Object Oriented Analysis, Object Oriented design, Object Oriented Programming. *Elements of the Object Model:* Programming Paradigm(programming style), The Major and Minor Elements of the Object Models, Abstraction, Encapsulation, Modularity, Hierarchy(single inheritance, multiple inheritance, Aggregation), Static and Dynamic Typing, Concurrency, Persistence.

UNIT II:

Classes and Objects-*The Nature of an Object*: What is and what is not an Object, State, Behavior, and Identity. *Relationships among Objects*: Links, Aggregation. *The Nature of a Class:* Interface and Implementation, Class Lifecycle. *Relationships among Classes*: Association: Semantic Dependencies, Multiplicity, Inheritance, Polymorphism, Aggregation, Dependencies. *The Interplay of Classes and Objects*: Relationship between Classes and Objects, *On Building Quality Classes and Objects:* Measuring the Quality of an Abstraction, Choosing Operations, Choosing Relationships, Choosing Implementations.

UNIT III:

Classification-*The Importance of Proper Classification:* The Difficulty of Classification, The Incremental and Iterative Nature of Classification. *Identifying classes and Objects:* Classical and Modern Approaches. *Object Oriented Analysis*: Classical Approaches, Behavior Analysis, Domain Analysis, Use Case Analysis, CRC Cards, Informal English Description, Structured Analysis. *Key Abstractions and Mechanisms*: Identifying Key Abstractions: Refining Key Abstractions, Naming Key Abstractions. Identifying Mechanisms.

UNIT IV:

The Unified Modeling Language:*Diagram Taxonomy*: Structure Diagrams, Behavior Diagrams. *The Use of Diagrams in Practice*: Conceptual, Logical and Physical Models, The Role of Tools. *The Syntax and Semantics of the UML*: The Package Diagrams, Component Diagrams, Deployment Diagrams, Use Case Diagrams.

UNIT V:

The Syntax and Semantics of the UML: Activity Diagrams, Class Diagrams, Sequence Diagrams, Interaction Diagrams, Composite Structure Diagrams, State Machine Diagrams, Timing Diagrams, Object Diagrams, Communication Diagrams.

TEXT BOOK:
1. Object-Oriented Analysis and Design with Applications, 3rd Edition, By: Robert A. Maksimchuk, Bobbi J. Young, Grady Booch, Jim Conallen, Michael W. Engel, Kelli A. Houston, Pearson education.
REFERENCE BOOKS:

1.James Rumbaugh, Jacobson and Booch, Unified Modeling Language reference manual,PHI.

2. Ali Bahrami, Object oriented system development-using the unified modeling language, Tata McGraw Hill international edition, computer science series.

OBJECT ORIENTED ANALYSIS AND DESIGN LAB

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C5-P	Object oriented analysis and design lab	2	30	1

List of Lab Experiments

1. Demonstrate Package Diagram forHydroponics Gardening system.
2. Demonstrate Component Diagram for the Environmental control system.
3. Demonstrate Deployment Diagram for Environmental control system.
4. Identify Use Cases and develop the Use Case Diagram for Hydroponics Gardening system.
5. Demonstrate Activity Diagram for Hydroponics Gardening system.
6. Demonstrate Class Diagram for the Environmental control system.
7. Demonstrate sequence diagram Environmental controller system.
8. Demonstrate sequence diagram for returning and removing books for the library system
9. Demonstrate use case for returning book with fine for library system.
10. Draw the State Machine Diagram for the Duration Timer.
11. Draw the Interaction Diagram for Library system.
12. Draw the Composite structure diagram for the Hydroponics Gardening system's water tank.
13. Draw the Timing Diagram for a valve object that is controlled to fill the Water storage tank object in Hydroponics Gardening system.
14. Demonstrate Object Diagram for the library system.
15. Draw the Communication Diagram for the Hydroponics Gardening system.

DATA BASE MANAGEMENT SYSTEM

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C6	DATA BASE MANAGEMENT SYSTEM	4	60	4

Course Objectives:

- Graduates will have the expertise in analyzing real time problems and providing appropriate solutions related to Computer Science & Engineering.
- Graduates will have the knowledge of fundamental principles and innovative technologies to succeed in higher studies and research.
- Graduates will continue to learn and to adapt technology developments combined with deep awareness of ethical responsibilities in profession.

Course Outcomes:

- An ability to apply Knowledge of computing and mathematics in Computer Science & Engineering.
- An ability to analyze a problem, identify and define the computing requirements appropriate to its solution.
- An ability to design, implement and evaluate a computer-based system to meet desired needs with appropriate societal considerations.
- An ability to conduct investigations, interpret data and provide conclusions in investigating complex problems related to Computer Science & Engineering.
- An ability to engage in continuing professional development and life-long learning.

Syllabus

UNIT-I

Overview of Database Systems: Managing Data, File System versus DBMS, Advantages of DBMS, Describing and storing Data in a DBMS, Queries in DBMS, Transaction Management, Structure of DBMS, People who work with DBMS

Introduction to Database design : ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

UNIT-II

Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views destroying/ altering Tables and Views.

Relational Algebra and Calculus: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple relational Calculus - Domain relational calculus - Expressive Power of Algebra and calculus.

UNIT-III

Working with MySQL - Introduction: What is MySQL?, Database Terms, Install MySQL on windows, Install MySQL on Ubuntu, Access MySQL, Start the Command Line Interface. **MySQL Command Syntax:** SQL Commands Syntax, Data Types Create a Database, Create a User, Create a Table. **Important SQL Commands :** Insert New Records, Modify a Table, Query a Database, Advanced Select Statements, Remove a Row, Limit Clause, Update the contents of a Field, Sort Results,LogicalOperators **Advanced Usage :** Primary Keys, MySQL Functions, MySQL string functions, MySQL date functions, MySQL aggregate functions

Basics of Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relational Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form

UNIT IV

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing – Transaction and System Concepts – Desirable Properties of Transactions – Characterizing schedules based on Serializability – Characterizing schedules based on Recoverability

Concurrency Control Techniques: Two Phase Locking Techniques for Concurrency Control – Concurrency Control Based on Timestamp ordering – Multiversion Concurrency Control Techniques

UNIT-V

Disk Storage, Basic File Structures and Hashing: Introduction, Secondary Storage Devices, Buffering of Blocks, Placing file Records on Disk, Operations on Files, Files of Unordered Records, Files of Ordered Records, Hashing Techniques, Other Primary File Organizations, Parallelizing Disk Access using RAID Technology.

Indexing Structures for Files: Types of Single-Level Ordered Indexes, Multilevel Indexes, Dynamic Multilevel Indexes Using B-Trees and B+ Trees, Indexes on Multiple Keys, Other Types of Indexes.

TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rd Edition, 2003.
2. MySQL Introduction by byAntunPeicevic, First edition, Technical editor: Marko Maslac Copyright© 2016 Geek University Press (UNIT-III Chapter 1)
3. Fundamentals of Database Systems, RamezElmasri, Shamkant B. Navathe, Sixth Edition (for UNIT-III Chapter 2 and UNIT-IV,UNIT V)

REFERENCES BOOKS:

1. Database Principles, Programming, and Performance, P.O'Neil, E.O'Neil, 2nd ed., ELSEVIER.
2. Database Systems, A Practical approach to Design implementation and Management Fourth edition, Thomas Connolly, carolynBegg, Pearson education.
3. Database Systems Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.

DATA BASE MANAGEMENT SYSTEM LAB

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
II	C6-P	DATA BASE MANAGEMENT SYSTEM LAB	2	30	1

List of Experiments

Cycle-I: Aim: Marketing company wishes to computerize their operations by using following tables.

Table Name: Client- Master
Description: Used to store client information

Column Name	Data Type	Size	Attribute
CLIENT_ NO	Varchar2	6	Primary key and first letter must start with 'C'
NAME	Varchar2	20	Not null
ADDRESS 1	Varchar2	30	
ADDRESS S	Varchar2	30	
CITY	Varchar2	15	
PINCODE	Varchar2	8	
STATE	Varchar2	15	
BAL_DUE	Number	10,2	

Table Name: Product_ Master
Description: Used to store product information

Column Name	Data Type	Size	Attribute
PRODUCT _NO	Varchar2	6	Primary key and first letter must start with 'P'
DESCRIPTION	Varchar2	15	Not null
PROFIT _PERCENT	Number	4,2	Not null
UNIT _MEASUE	Varchar2	10	
QTY_ ON_ HAND	Number	8	
REORDER_ LVL	Number	8	
SELL _PRICE	Number	8, 2	Not null, cannot be 0

COST _PRICE	Number	8,2	Not null, cannot be 0

Table Name: Salesman_master
Description: Used to store salesman information working for the company.

Column Name	Data Type	Size	Attribute
SALESMAN_ NO	Varchar2	6	Primary key and first letter must start with 'S'
SALESMAN _NAME	Varchar2	20	Not null
ADDRESS1	Varchar2	30	
ADDRESS2	Varchar2	30	
CITY	Varchar2	20	
PINCODE	Number	8	
STATE	Vachar2	20	
SAL_AMT	Number	8,2	Not null, cannot be 0
TGT_TO_GET	Number	6,2	Not null, cannot be 0
YTD _SALES	Number	6,2	Not null
REMARKS	Varchar2	20	

Table Name: SALES-ORDER
Description: Used to store client's orders

Column Name	Data Type	Size	Attribute
ORDER_ NO	Varchar2	6	Primary key and first letter must start with 'S'
CLIENT _NO	Varchar2	6	Foreign Key
ORDER _DATE	Date		
DELY _ADDRESS	Varchar2	25	
SALESMAN_ NO	Varchar2	6	Foreign Key
DELY _TYPE	Char	1	Delivery: part(p)/ full(f) and default 'F'
BILL_ YN	Char	1	
DELY_ DATE	Date		Can't be less than order date
ORDER _STATUS	Varchar2	10	Values ("In Process", " Fulfilled", "Back Order", "Cancelled.

Table Name: SALES_ORDER_DETAILS
Description: Used to store client's order with details of each product ordered.

Column Name	Data Type	Size	Attribute
ORDER _NO	Varchar2	6	Primary key references SALES_ORDER table
PRODUCT_ NO	Varchar2	6	Foreign Key references SALES_ORDER_table
QTY_ ORDERED	Number	8	
QTY_ DISP	Number	8	
PRODUCT _RATE	Number	10,2	Foreign Key

Solve the following queries by using above tables.
1. Retrieve the list of names, city and the state of all the clients.
2. List all the clients who are located in 'Mumbai' or 'Bangalore'.
3. List the various products available from the product_master table.
4. Find the names of sales man who have a salary equal to Rs.3000.
5. List the names of all clients having 'a' as the second letter in their names.
6. List all clients whose Bal due is greater than value 1000.
7. List the clients who stay in a city whose first letter is 'M'.
8. List all information from sales-order table for orders placed in the month of July.
9. List the products whose selling price is greater than 1000 and less than or equal to 3000.
10. Find the products whose selling price is greater than 1000 and also find the new selling price as original selling price 0.50.
11. Find the products in the sorted order of their description.
12. Find the products with description as '540HDD' and 'Pen drive'.
13. Count the total number of orders.
14. Print the description and total qty sold for each product.
15. Calculate the average qty sold for each client that has a maximum order value of 15,000.
16. Find all the products whose quantity on hand is less than reorder level.
17. List the order number and day on which clients placed their order.
18. Find out the products and their quantities that will have to deliver in the current month.
19. Find the names of clients who have placed orders worth of 10000 or more.
20. Find the client names who have placed orders before the month of June,2008.

Cycle-II
Aim: A manufacturing company deals with various parts and various suppliers supply these parts. It consists of three tables to record its entire information. Those are as follows.

Supplier (Supplier_No, Sname, City, status)
Part(Part_no, pname, color, weight, city, cost)
Shipment (supplier_No, Part_no, city)
JX(project_no, project_name, city)
SPJX (Supplier_no, part_no, project_no, city)

1. Get supplier numbers and status for suppliers in Chennai with status > 20.
2. Get project names for projects supplied by supplier S.
3. Get colors of parts supplied by supplier S_1.
4. Get part numbers for parts supplied to any project in Mumbai.
5. Find the id's of suppliers who supply a red or pink parts.
6. Find the pnames of parts supplied by London supplier and by no one else.
7. Get the names of the parts supplied by the supplier 'Mart' and 'Miller'.
8. Get supplier names for suppliers who do not supply part P_2.
9. Get all parirs of supplier numbers such that the suppliers concerned are "colocated".

10. Get suppliers names for the suppliers who supply at least one red part.

Cycle –III Employee Database

Aim: An enterprise wishes to maintain a database to automate its operations. Enterprise divided into a certain departments and each department consists of employees. The following two tables describes the automation schemas.

Emp(Empno, Ename, Job, Mgr, Hiredate, Sal, Comm, Deptno)
Dept(Deptno, Dname, Loc)

1. List the details of employees who have joined before the end of September' 81.
2. List the name of the employee and designation of the employee, who does not report to anybody.
3. List the name, salary and PF amount of all the employees (PF is calculated as 10% of salary)
4. List the names of employees who are more than 2 years old in the organization.
5. Determine the number of employees, who are taking commission.
6. Update the employee salary by 20% , whose experience is greater than 12 years.
7. Determine the department does not contain any employees.
8. Create a view, which contains employee name and their manager names working in sales department.
9. Determine the employees, whose total salary is like the minimum salary of any department.
10. List the department numbers and number of employees in each department.
11. Determine the employees, whose total salary is like the minimum salary of any department.
12. List average salary for all departments employing more than five people.
13. Determine the names of employees, who take highest salary in their departments.
14. Determine the names of employees, who earn more than their managers.
15. Display ename, dname, even if no employee belongs to that department (use outer join)

Cycle- IV
An Airline system would like to keep track their information by using the following relations.

FLIGHTS(fl_no: integer, from: string, to: string, distance: integer, price: integer)
AIRCRAFT(aid: integer, aname: string, cruising_range: integer)
CERTIFIED(eid: integer, aid: integer)
Employees(eid: integer, ename: string, salary: real)

Note that the employees relation describes pilots and other kinds of employees as well; every pilot is certified for aircraft and only pilots are certified to fly. Resolve the following queries.
1. Find the names of pilots whose salary is less than the price of the cheapest route from Newyork to Chicago.
2. For each pilot who is certified for more than 2 aircraft, find the eid's and the maximum cruising range of the aircraft that he or she certified for.
3. For all aircraft with cruising range over 1,500 miles, find the name of the aircraft and the average salary of all pilots certified for this aircraft.
4. Find the aid's of all aircraft than can be used from chicaga to LosAngels.
5. Find the name of the pilots certified from some Boeing aircraft.

6. Print the enames of pilots who can operate planes with cruising range greater than 3,500 miles, but are not certified by Boeing aircraft.
7. Find the eid's of employees who are certified for exactly 2 aircrafts.
8. Find the total amount paid to employees as salaries.
9. Find the aid's of all than can be used on non-stop flights from Chennai to Dubai.
10. Find the eid's of employee who make second highest salary.

PL/SQL PROGRAMS

1. Write a PL/SQL program to check the given number is strong or not.
2. Write a PL/SQL program to check the given string is palindrome or not.
3. Write a PL/SQL program to swap two numbers without using third variable.
4. Writ a PL/SQL program to generate multiplication tables for 2, 4, 6.
5. Write a PL/SQL program to check the given number is Amstrong or not.
6. Write a PL/SQL code to find the factorial of any number.
7. Write a PL/SQL program to display sum of even numbers and sum of odd numbers in the given range.
8. Write a PL/SQL program to check the given number is palindrome or not.
9. The HRD manager has decide to raise the employee salary by 15% write a PL/SQL block to accept the employee number and update the salary of that employee. Display appropriate message based on the existence of the record in Emp table.
10. Write a PL/SQL program to display to 10 rows in Emp table based on their job and salary.
11. Write a PL/SQL program to raise the employee salary by 10% for department number 30 people and also maintain the raised details in the raise table.
12. Write a procedure to update the salary of Employee, who are not getting commission by 10%.
13. Write a PL/SQL procedure to prepare an electricity bill by using following table.
   Table used: Elect

Name	Null?	Type
MNNO	NOT NULL	NUMBER(3)
CNAME		VARCHAR2(20)
CUR_READ		NUMBER(5)
PREV_READ		NUMBER(5)
NO_UNITS		NUMBER(5)
AMOUNT		NUMBER(8,2)
SER_TAX		NUMBER(8,2)
NET_AMT		NUMBER(9,2)

14. Write a PL/SQL program to prepare an telephone bill by using following table and print the monthly bills for each customer.

   Table used: Phone

Name	Null?	Type
TEL_NO	NOT NULL	NUMBER(6)
CNAME		VARCHAR2(20)
CITY		VARCHAR2(10)
PR_READ		NUMBER(5)
CUR_READ		NUMBER(5)
NET_AMT		NUMBER(5)
TOT-AMT		NUMBER(8,2)

15. Write a PL/SQL program to raise the employee salary by 10 %, who are completed ther 25 years of service and store the details at appropriate tables
(Define the Retair_ Emp_Table)
16. Write a PL/SQL program to evaluate the grade of a student with following conditions:
For pass: all marks > 40
For I class: Total % > 59
For II Class: Total % between >40 and < 60
For III class: total % = 40
And also maintain the details in abstract table.

1. Table STD

Name	Null?	Type
NO	NOT NULL	NUMBER
NAME		VARCHAR2(10)
INTNO		NUMBER
CLASS	NOT NULL	VARCHAR2(10)
M1		NUMBER
M2		NUMBER
M3		NUMBER
M4		NUMBER
M5		NUMBER

2.Table Abstract

Name	Null?	Type
STDNO		NUMBER
STDNAME		VARCHAR2(10)
CLASS		VARCHAR2(10)
MONTH		VARCHAR2(10)
INTNO (INTEGER NUMBER)		NUMBER
TOT		NUMBER
GRADE		VARCHAR2(10)
PERCENT		NUMBER
DAT_ENTER		DATE

Semester III

Accounting and Financial Management

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
III	C7	Accounting and Financial Management	4	60	4

Course Objectives:

- This paper is designed to impart knowledge regarding concepts of Financial Accounting. This course is useful for Students to get placements in different offices as well as companies in Accounts departments.

Course Outcomes:

- Company Setup & Configurations.
- Recording Financial Transactions.
- Financial Reports Analysis.

Syllabus

Unit I

Fundamentals of Accounting

Meaning of Accounting, its scope; Objects and limitations; Meaning and application of double entry system , Books of Accounts , Ledgers -Debtors ledger, Creditors ledgers and General ledger; Cash Book and Bank Reconciliation Statement.

Unit II

Financial Statements

Meaning and Components of Financial statements, Preparation of Financial Statements, Trading Account, Profit and loss Account, Meaning and Purpose of Balance Sheet, Steps for preparation of Balance Sheet, Marshalling of Balance Sheet, Format of Balance Sheet

Unit III

Accounting Ratio and Cash Flow Statement

Ratio Analysis, Objectives of Ratio Analysis, Classification of Accounting Ratios, Advantages of Ratio Analysis, Analysis of Financial Statement through Ratios, Cash Flow Statement,

Meaning of Cash Flow Statement, Importance of Cash Flow Statement, Cash Flow Statement as per as 3, Illustration Preparation of Cash Flow Statement.

Unit IV

Cost Concepts and Cost Sheet

Meaning of Cost, Classification of Cost, Various Cost Concepts, Cost Centre, Types of Cost Centres, Cost Unit, Elements of Costs, Cost Sheet

Unit V

Budgetary Control and Marginal Costing

 Meaning of Budget, Purpose of Budget, Budgetary Control: Meaning and Essentials, Merits OF budgetary Control system, Steps in preparation of budgets, Classification of budgets, Standard cost and standard costing, Variance analysis, Marginal cost and marginal costing, Advantages of marginal costing, Managerial Application of marginal costing, Break Even Analysis

Capital and Working Capital

Meaning of capital, cost of capital, shares, debentures, capitalisation and capital structure; Meaning of working capital, its components and estimation.

Suggested Readings:

1. Financial Accounting, Ashis Bhattacharya, prentice-Hall India Publication.

2. Financial Accounting, S.N. Maheshwari, Vikas Publication House Pvt. Ltd., New Delhi

3.Theory and Practice of Accountancy By B. B. Dam, R. A. Maheswari, R. Barman and B Kalita.

Accounting and Financial Management Lab

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
III	C7-P	Accounting and Financial Management Lab	2	30	1

List of Lab Experiments

1) Create Company using Accounts only.
2) Alter a Company, Shut a Company and Delete a Company in Tally?
3) Splitting Company Data.
4) Creation of Group Companies.
5) Single Ledger Creation with Interest parameters setting.
6) Multi Ledger creation any Ten Accounts.
7) Bank Reconciliation Statement in Tally.
8) Creation of Tally Vault & Change Tally vault Password.
9) Creating Contra voucher.
10) Creating Payment voucher.
11) Creating Receipt voucher.
12) Creating Journal voucher.
13) Creating Sales voucher.
14) Creating Credit Note voucher.
15) Creating Purchases voucher.
16) Creating Debit Note voucher.
17) Displaying Day Book.
18) Displaying Trial Balance.
19) Displaying Profit and Loss Account.
20) Displaying Balance Sheet.

Object Oriented Programming through Java

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
III	C8	Object Oriented Programming through Java	4	60	4

Course Objectives:

To makethe students understand fundamentals ofJavaprogramming.

➢ To exposethe studentsto Window based applications usingAWT

➢ To makethe studentsto design appropriateExceptionHandlingin Java

➢To makethe studentsto understand the concepts ofThreads,Files and

➢I/O Streams, Applets,Networkingin java.

Course Outcomes:

Thestudent would become competent enoughtowrite, debug, anddocument

well-structured javaapplications

➢Demonstrate good object-oriented programmingskillsinJava

➢ Ableto describe,recognize, applyand implementselected design patterns in Java

➢ Understand thecapabilities and limitations of Java

➢Be familiarwith common errors inJava and its associated libraries

➢ Develop excellent debuggingskills

Syllabus

Unit I

Object Oriented Programming: Introduction to OOP, Objects and Classes, Characteristics of OOP, Difference between OOP and Procedure Oriented Programming.

Introduction to Java Programming: Introduction, Features of Java, Comparing Java and other languages, Applications and Applets, Java Development Kit, More Complex Programs, Java Source file structure, Prerequisites for Compiling and Running Java Programs.

Unit II

Java Language Fundamentals: The building Blocks of Java, Data types, variable declarations, wrapper classes, Operators and Assignment, Control structures, Arrays, Strings, The String Buffer Class.

Java as an OOP Language: Defining classes, Modifiers, Packages, Interfaces.

Unit III

Exception Handling: Introduction, Basics of Exception Handling in Java, Exception Hierarchy, Constructors and Methods in Throwable class, Unchecked and Checked Exceptions, Handling Exceptions in Java, Exception and Inheritance, Throwing User-defined Exceptions, Redirecting and Rethrowing Exceptions, Advantages of Exception – Handling Mechanism.

Multithreading: An Overview of Threads, Creating Threads, Thread Life–cycle, Thread Priorities and Thread Scheduling, Thread Synchronization, Daemon Threads, Thread groups, Communication of Threads.

Unit IV

Files and I/O Streams: An Overview of I/O streams, Java I/O, File Streams, FileInputStream and FileOutputStream, Filter streams, Random Access File, Serialization.

Applets: Introduction, Java applications versus Java Applets, Applet Life-cycle, Working with Applets, The HTML Applet Tag.

Database Handling Using JDBC: An Overview of DBMS, JDBC Architecture, Working with JDBC

Unit V

Servlets: Introduction, How to run servlets, The Life–cycle of the servlet, servlet API, Multitier Applications using JDBC from a servlet.

Networking and Remote Method Invocation: Introduction to Networking, Understanding Ports, Networking Classes in JDK, Introduction to RMI, RMI Architecture – Implementing Remote class and interface – security.

Text books:Object Oriented Programming through Java, Universities Press (2008),by

P. Radha Krishna.

REFERENCE BOOKS:

Author	Title	Publisher
Venkateswarlu,EVPrasad, S. Chand	Learn ObjectOrientedProgramming usingJava	S CHAND
DrKSomaSundaram	Programmingin Java2	JAICOPublishinghouse
R Nageswararao	JAVA8	CoreJava BlackBook. An Integrated approach

Object Oriented Programming through Java Lab

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
III	C8-P	Object Oriented Programming through Java Lab	2	30	1

List of Lab Experiments

1   WAPtofindtheaverageandsumoftheNnumbersUsingCommandlineargument.
2   WAPtoDemonstrateTypeCasting.
3   WAPtofindthenumberofargumentsprovideatruntime.
4   WAPtoTest thePrimenumber.
5   WAPtocalculatetheSimpleInterestandInputbytheuser.
6   WAPtocreateaSimpleclasstofindouttheAreaandperimeterofrectangleandboxusingsuperandthiskeyword.
7   WAPtofindG.C.Dofthenumber.
8   WAPtodesignaclassaccountusingtheinheritanceandstaticthatshowallfunctionofbank(withrawal,deposite).
9   WAPtofindthefactorialofagivennumberusingRecursion.
10   WAPtodesignaclassusingabstractMethodsandClasses.
11   WAPtodesignaStringclassthatperformStringMethod(Equal,Reversethestring,changecase).
12   WAPtohandletheExceptionusingtryandmultiplecatchblock.
13   WAPthatImplement theNestedtryStatements.
14   WAPtoCreateapackagethataccessthememberofexternalclassaswellassamepackage.
15   WAPthatimporttheuserdefinepackageandaccesstheMembervariableofclassesthatContainedbyPackage.
16   WAPthatshowthepartialimplementationofInterface.
17   WAPtoHandletheuserdefinedExceptionusingthrowkeyword.
18   WAPtocreateathreadthatImplementtheRunableinterface.
19   WAPtoImplementInterthreadcommunication.
20   WAPtoDrawtheline,Rectangle,oval,textusingthegraphicsmethod.
21   WAPto create Menuusingtheframe.
22   WAPto create Dialogbox.
23   WAPtoImplementtheflowlayoutAndBorderLayout.
24   WAPtoImplementtheGridLayout,CardLayout.
25   WAPtodemonstrateSystemclock.
26   WAPtocreateFramethatdisplaythestudentinformation.

OPERATING SYSTEMS

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
III	C9	OPERATING SYSTEMS	4	60	4

Course Objectives:

1. To know the basic Structure, Components and Organization of Operating System.
2. To learn the notation of a Process-a Program in Execution, Management, Scheduling and Classic Problems of Synchronization.
3. To gain knowledge in various Memory Management Techniques.
4. To understand Unix Operating System and Various File operations.

Course Outcomes:

The students will be able to:
1. Understand the main components and Structure of Operating System& their functions.
2. Analyze various ways of Process Management& CPU Scheduling Algorithms.
3. Evaluate various device and resources like Memory, Time and CPU Management techniques in distributed systems.
4. Apply different methods for Preventing Deadlocks in a Computer System.
5. Create and build an Application/Service over the UNIX operating system.

Syllabus

Unit I
Introduction: What Operating Systems do, Computer system organization, Computer system architecture, Operating system structure.**System Structure:** Operating system services, User operating system interface, System Calls, Types of System Calls, Overview of UNIX Operating System, Basic features of Unix operating System.

Unit II
Process Concept: Process Concept, Process Scheduling, Operation on Process. **Process Scheduling:**Basic Concepts, Scheduling Criteria, Scheduling Algorithms, CPU Scheduling in UNIX.

Unit III
Synchronization: Background, The critical section problem. **Semaphores:** Usage, Implementation, Deadlocks and Starvation, Classic problems of synchronization. **Deadlocks:** System Model, Deadlock Characterization, Deadlock Prevention.

Unit IV

Memory Management: Background, Basic hardware, Address Binding, Swapping, Contiguous memory allocation, **Paging:**Basic Method, Hardware Support, Protection, Memory Management in UNIX.

Unit V

Files and Directories in UNIX, File Structure, File System Implementation of Operating System Functions, File permission, Basic Operation on Files, Changing Permission Modes, Standard files, Processes Inspecting Files, Operating On Files

TEXT BOOKS
1. Operating system Concepts: Abraham Silberschatz, Peter B. Galvin, Greg Gagne, 8th Edition, Wiley.
2. Unix and shell Programming by B.M Harwani, OXFORD University Press

REFERENCE BOOKS:
1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Principles of Operating Systems by Naresh Chauhan, OXFORD University Press
3. Unix Concept and application- Sumitabhadas
4. Unix Shell Programming-YashwantKanetkar

OPERATING SYSTEMS Lab

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
III	C9-P	OPERATING SYSTEMS Lab	2	30	1

List of Experiments

1. Introduction to UNIX Operating System, Compare with Windows OS. Writing and executing simple Hello World C Program in UNIX Environment.
2. Working with vi editor: Creating and editing a text file using the standard commands.
3. Getting hands-on on basic UNIX Commands.
4. Execute of various file/directory handling commands.
5. Write a Simple shell script for basic arithmetic and logical calculations.
6. Write Shell scripts to check various attributes of files and directories.
7. Write Shell scripts to perform various operations on give n strings.
8. Write Shell scripts to explore system variables such as PATH, HOME etc.
9. Use seed instruction to process /etc/password file.
10. Write a shell script to display list of users currently logged in.
11. Write a shell script to delete all the temporary files.
12. Write a shell script to search an element from an array using binary searching.
13. Write C programs to implement the following Scheduling Algorithms:
    1. First Come First Serve.
    2. Shortest Job First.
    3. Round Robin.

Reference Text Books:
1. Brian W. Kernighan and Rob Pike, "The UNIX Programming Environment" Prentice Hall India (Edition available in LRC and in the form of E Book on student resource).
2. YashwantKanetkar, "UNIX Shell Programming" BPB Publications (First Edition).

Semester-IV

Cyber Laws

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C10	Cyber Laws	4	60	4

Course Objectives:

- Enable learners to understand, explore, and acquire a critical understanding of Cyber Law.
- Develop competencies for dealing with frauds and deceptions (confidence tricks, scams) and other cyber-crimes for example, child pornography etc. that are taking place via the Internet.
- Make learners conversant with the social and intellectual property issues emerging from 'Cyberspace'.
- Explore the legal and policy developments in various countries to regulate Cyberspace.
- Develop the understanding of relationship between commerce and cyberspace; and give learners in depth knowledge of Information Technology Act and legal frame work of Right to Privacy, Data Security and Data Protection.

Course Outcomes:

At the end of the course, students should be able to:
- Critically evaluate ongoing developments in law relating to information technologies.
- Display an understanding of how these developments relate to one another.
- Examine areas of doctrinal and political debate surrounding rules and theories;
- Evaluate those rules and theories in terms of internal coherence and practical outcomes.
- Draw on the analysis and evaluation contained in primary and secondary sources.

Syllabus

Unit I
Introduction: Computers and its Impact in Society, Overview of Computer and Web Technology, Need for Cyber Law, *Cyber Jurisprudence*atInternational andIndian Level.

Unit II
Cyber Law- International Perspectives: UN &International Telecommunication Union (ITU)Initiatives, Council of Europe -Budapest Convention on Cybercrime, Asia-Pacific Economic Cooperation(APEC), Organization for Economic Co-operation and Development(OECD), World Bank, Commonwealth of Nations.

Unit III
Constitutional& Human Rights Issues in Cyberspace: Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace – Access to Internet, Right to Privacy, Right to Data Protection.

Unit IV

Cyber Crimes& Legal Framework: Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft &Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act, 2000.

Unit V

Cyber Torts: Cyber Defamation, Different Types of Civil Wrong sunder the IT Act, 2000, Intellectual Property Issues in Cyber Space, Interface with Copyright Law, Interface with Patent Law, Trade marks &Domain Names Related issues

Reference Books
1. ChrisReed&JohnAngel,*Computer Law*, OUP,NewYork,(2007).
2. JusticeYatindraSingh,*Cyber Laws*, UniversalLawPublishingCo, New Delhi, (2012).
3. VermaK,MittalRaman,*LegalDimensionsofCyberSpace*,IndianLawInstitute,NewDelhi,(2004)
4. JonthanRosenoer,*Cyber Law*, Springer,New York, (1997).
5. SudhirNaib,TheInformationTechnologyAct,2005:AHandbook,OUP,NewYork,(2011)
6. S.R.Bhansali,   *Information TechnologyAct,2000*,UniversityBookHousePvt.Ltd.,Jaipur (2003).
7. VasuDeva,*Cyber Crimes and Law Enforcement*,CommonwealthPublishers,New Delhi,(2003).

Cyber Laws Lab

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C10-P	Cyber Laws Lab	2	30	1

Lab Experiments

1. Write a program for recovering deleted files from a hard disk.
2. Write a program for gathering evidence.
3. Write a program for viewing files of various formats.
4. Write a program for locating files needed for a forensics investigation.
5. Write a program for performing image and file conversions.
6. Write a program for handling evidence data.
7. Write a program for creating a disk image file of a hard disk partition.
8. Give at least ten cyber crime scenarios to students and make them analyse the scenario and submit report citing cyber laws which are violated.

DATA MINING and WARE HOUSING

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C11	DATA MINING and WARE HOUSING	4	60	4

Course Objectives:

- Be familiar with mathematical foundations of data mining tools.
- Understand and implement classical models and algorithms in data warehouses and data mining
- Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- Master data mining techniques in various applications like social, scientific and environmental context. Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Course Outcomes:

(Five units with each unit having 12 hours of class work)
At the end of the course, the student will demonstrate the following.
The students will be able to:

- Examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
- Apply preprocessing statistical methods for any given raw data
- Discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes
- Comprehend the roles that data mining plays in various fields and manipulate different data mining techniques
- Select and apply proper data mining algorithms to build analytical applications.
- Evaluate and implement a wide range of emerging and newly-adopted methodologies and technologies to facilitate the knowledge discovery.

Syllabus

Unit I
Introduction: What Motivated Data Mining? Why Is It Important?, So, What Is Data Mining? , *Data Mining—On What Kind of Data?*: Relational Databases, Data Warehouses, Transactional Databases. Data Mining Functionalities—What Kinds of Patterns Can Be Mined? , *Data Preprocessing:* Why Preprocess the Data?, *Descriptive Data Summarization*: Measuring the

Central Tendency, Measuring the Dispersion of Data, Data Cleaning, Data Integration and Transformation, Data Reduction.

Unit II
Data Warehouse and OLAP Technology: An Overview , What Is a Data Warehouse? , A Multidimensional Data Model, From Tables and Spreadsheets to Data Cubes, Stars, Snowflakes, and Fact Constellations: Schemas for Multidimensional databases, Examples for Defining Star, Snowflake and Fact Constellation Schemas, Measures: Their Categorization and Computation, Concept Hierarchies, OLAP Operations in the Multidimensional Data Model. *Data Warehouse Architecture:*Steps for the Design and Construction of Data Warehouses, A Three-Tier Data Warehouse Architecture, Data Warehouse Back-End Tools and Utilities. Data Warehouse Implementation.

Unit III
Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and a Road Map, *Efficient and Scalable Frequent Itemset Mining Methods:* The Apriori Algorithm: Finding Frequent Itemsets Using Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, Mining Frequent Itemsets without Candidate Generation. *Mining various kinds of Association Rules:* Mining Multilevel Association Rules, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses.

Unit IV
Classification and Prediction: What Is Classification? What Is Prediction? , Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Decision Tree Induction, Attribute Selection Measures. *Bayesian Classification***:** Naïve Bayesian Classification, Bayesian Belief Networks, Training Bayesian Belief Networks. *Rule-Based Classification*: Using IF-THEN Rules for Classification, Rule Extraction from a Decision Tree, Rule Induction Using a Sequential Covering Algorithm.

Unit V
Cluster Analysis: What is Cluster Analysis? , Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods. *Hierarchical Methods*: Agglomerative and Divisive Hierarchical Clustering, BIRCH: Balanced Iterative Reducing and Clustering Using Hierarchies . Density-Based Methods, Outlier Analysis.

Prescribed Text Book:
  1. Data Mining: Concepts and Techniques Second Edition Jiawei Han University of Illinois at Urbana-Champaign MichelineKamber

References:
  1. Data Mining by VikramPudi, P. Radha Krishna, Oxford Universal Press
  2. Data Warehousing by ReemaThareja, Oxford University Press
  3. J. Han, M. Kamber and J. Pei, Data Mining: Concepts and Techniques, 3rd.Edition Morgan Kaufmann, 2011
  4. Introduction to data mining –G. K. Gupta, PHI
  5. Data mining, Data warehouse &Olap-Berson, Tata McGraw Hill

Student Activity:
  1. Predict the course taken by a student based on his activities and way of learning
  2. Learn visual patterns of any real time data

DATA MINING and WARE HOUSING Lab

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C11-P	DATA MINING and WARE HOUSING Lab	2	30	1

List of Experiments

1. Demonstration of preprocessing on dataset student.arff.
2. Demonstration of preprocessing on dataset labor.arff.
3. Demonstration of Association rule process on dataset contactlenses.arff using Apriori algorithm.
4. Demonstration of Association rule process on dataset test.arff using Apriori algorithm.
5. Demonstration of classification rule process on dataset student.arff using j48 algorithm.
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm.
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm.
8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm.
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means.
10. Demonstration of clustering rule process on dataset student.arff using simple k-means.

Web Programming

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C12	Web Programming	4	60	4

Course Objectives:

- To learn about the Building Blocks of PHP, Arrays.
- To learn about PHP functions and file handling.
- To learn about working with Forms, Sessions, Cookies.
- To learn about Java Script basics.
- To learn about Angular JS basics.

Course Outcomes:

- Able to use Building Blocks of PHP, Access array elements.
- Able to use various functions and handle data using files..
- Able to use working with Forms, Sessions, Cookies.
- Able to implement Java Script.
- Able to implement basic concepts of Angular JS for Web development.

Syllabus

Unit-I: PHP Basics   **9 Hrs.**
Introduction, Identifiers, Variables, Constants, Data Types, Operators, Conditional Statements, PHP Loops.

Working with Arrays: 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-II: PHP Advanced   **9 Hrs.**

Advantages of Using functions, Types of functions, creating and invoking functions, returning values, recursive functions, Object Oriented Concepts, File handling and Data Storage: creating, open/close a file, file operations: read,write,append. File truncate, file uploading, EOF in PHP.

Unit-III: Working with Forms in PHP   **9 Hrs.**
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 Unsettling Variables, Using Sessions in an Environment with Registered Users.

Unit-IV: Introduction to Java Script   **9 Hrs.**
Java Script: Introduction – Basic commands – Variables – Operators – Control structures – Arrays - Window and document object – Forms and form elements – String, math and dates – multiple windows.

Unit-V: Angular JS   **9 Hrs.**
Getting started with Angular JS, Modules, Components, Built in Directives, Custom directives. Use of built – in directive, Data Binding, filters, custom filters, constants.

References:
1. FUNDAMENTALS OF OPEN SOURCE SOFTWARE, MN RAO, PHI, 2015.
2. Julie C. Meloni, PHP MySQL and Apache, SAMS Teach Yourself, Pearson Education (2007).
3. Web Technologies, A. a. Puntambekar, 2013, Technical Publications

4. https://books.goalkicker.com/AngularJSBook/

Web Programming Lab

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C12-P	Web Programming Lab	2	30	1

Lab experiments

1. Demonstrating PHP operators.
2. Create a PHP program to find odd or even number from given number.
3. Write a PHP program to find maximum of three numbers.
4. Write a PHP program to swap two numbers.
5. Demonstrating while loop in PHP.
6. Demonstrating for loop in PHP.
7. Demonstrating do – while loop in PHP.
8. Demonstrating for each loop in PHP.
9. Write a PHP program for accessing array elements.
10. Write a PHP program to demonstrate various string functions.
11. Write a PHP program to demonstrate Date and Time functions.
12. Write a PHP program to demonstrate invoking functions.
13. Demonstrate recursive function in PHP.
14. Write a PHP program to perform read and write operations on a file.
15. Creating user login form in PHP.
16. Demonstrating Sending Mail on Form Submission in PHP.
17. Demonstrating File Uploads.
18. Demonstrating Working with Cookies.
19. Demonstrating User Sessions.
20. Demonstrating Sessions in an Environment with Registered Users.
21. Demonstrating basic commands in java script.
22. Demonstrating conditional structures in Java Script.
23. Demonstrating looping structures in Java Script.
24. Demonstrate accessing array elements in java script.
25. Demonstrating forms and form elements in java script.
26. Demonstrating multiple windows in java script.
27. Demonstrating built-in directives in Angular JS.
28. Demonstrating custom directives in Angular JS.
29. Demonstrating filters in Angular JS.
30. Demonstrating Data binding in Angular JS.

Semester IV
DESIGN OFOBJECT ORIENTED APPLICATIONS

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C13	DESIGN OFOBJECT ORIENTED APPLICATIONS	4	60	4

Course Objectives:

- To teach the realistic application of object-oriented analysis and design within a variety of problem domain.

Course Outcomes:

By the end of the course, student will be able to:
- Have Knowledge in micro and macro process.
- Have Knowledge in management planning, quality assurance and metrics along with documentation of object oriented development.
- Have Knowledge in system architecture.
- Basic knowledge in AI and Data Acquisition.
- Knowledge in applications of Object Oriented Design.

Syllabus

UNIT I:

Process-*First Principles*: Traits of Successful Projects: Strong Architectural Vision, Iterative and Incremental Lifecycle. Toward a Rational Development Process,*The Macro Process*: The Software Development Lifecycle, Overview, The Macro Process Content Dimension-Disciplines, The Macro Process Time Dimension-Milestones and Phases, The Macro Process Time Dimension-Iterations, Release Planning. *The Micro Process:* The Analysis and Design Process, Overview, Level of Abstraction, Activities, Products, The Micro Process and Level of Abstraction, Identifying Elements, Defining Elements of Collaborations, Defining Element Relationships, Detailing Element Semantics.

UNIT II:

Pragmatics-*Management Planning:* Risk Management, Task Planning, Development Review. *Staffing:* Resource Allocation, Development Team Roles. *Release Management:* Configuration Management and Version Control, Integration, Testing. *Reuse:* Elements of Reuse, Institutionalizing Reuse. *Quality Assurance and Metrics*: Software Quality, Object-Oriented Metrics. *Documentation:* Development Legacy, Documentation Contents. *Tools*: Kinds of Tools, Organizational Implementations. *Special Topics*: Domain-Specific Issues, Adopting Object-Oriented Technology. *The Benefits and Risks of Object-Oriented Development*: The Benefits of Object Oriented Development, The Risk of Object Oriented Development.

UNIT III:

System Architecture:*Satellite-Based Navigation*: Inception, Elaboration, Construction, Post-Transition. **Control System:** *Traffic Management:* Inception, Elaboration, Construction, Post-Transition.

UNIT IV:

Artificial Intelligence: *Cryptanalysis:* Inception, Elaboration, Construction, Post-Transition. **Data Acquisition:***Weather Monitoring station*: Inception, Elaboration, Construction, Post-Transition.

UNIT V:

Web Application: *Vacation Tracking System:* Inception, Elaboration, Construction, Transition and Post-Transition.

Object-Oriented Programming Languages: Language Evolution, Smalltack, C++, Java.

TEXT BOOK:
1. Object-Oriented Analysis and Design with Applications, 3rd Edition, By: Robert A. Maksimchuk, Bobbi J. Young, Grady Booch, Jim Conallen, Michael W. Engel, Kelli A. Houston, Pearson education.

REFERENCE BOOKS:
1.Grady Booch, Object Oriented Analysis and Design with Applications, 2rd Edition, Pearson education 1999.

2.Jacobson ed al., The Unified Software Development Process, A W 1999.

3. Tom Pender,UML Bible, John Wiley and sons.

DESIGN OFOBJECT ORIENTED APPLICATIONS LAB

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C13-P	DESIGN OFOBJECT ORIENTED APPLICATIONS LAB	2	30	1

Lab Experiments

1. Develop a mini project for Satellite-Based Navigation.
2. Develop a mini project for Traffic Management.
3. Develop a mini project for Cryptanalysis.
4. Develop a mini project for Weather Monitoring Station.
5. Develop a mini project for Vacation Tracking System.

DATA ANALYTICS USING R

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C14	DATA ANALYTICS USING R	4	60	4

Course Objectives:

This course will cover all the fundamental algorithms and techniques used in Data Analytics and provide exposure to theory as well as practical knowledge through R used in data analytics. After completing the course, student will learn,

- Fundamental basics of statistics used in analysing the data
- How to find the pattern in the given dataset
- How to interpret the data graphically
- How to apply different types of algorithms for the given dataset

Course Outcomes:

- Data-Visualization tools and techniques offer executives and other knowledge workers new approaches to dramatically improve their ability to grasp information hiding in their data.
- Data visualization is a general term that describes any effort to help people understand the significance of data by placing it in a visual context.
- Patterns, trends and correlations that might go undetected in text-based data can be exposed and recognized easier with data visualization software.
- It isn't just the attraction of the huge range of statistical analyses afforded by R that attracts data people to R. The language has also developed a rich ecosystem of charts, plots and visualizations over the years.
- ggplot2 is a data visualization package for the statistical programming language R.

Syllabus

Unit I

Introduction:

Introducing to R Data Structures –Help functions in R –Vectors –Scalars –Declarations –recycling –Common Vector operations –Using all and any –Vectorized operations –NA and NULL values –Filtering – Vectorised if-then else –Vector Equality –Vector Element names

Matrices, Arrays and Lists:

Creating matrices –Matrix operations –Applying Functions to Matrix Rows and Columns –Adding and deleting rows and columns –Vector/Matrix Distinction –Avoiding Dimension Reduction –Higher Dimensional arrays –lists –Creating lists –General list operations –Accessing list components and values –applying functions to lists –recursive lists

Data Frames:

Creating Data Frames –Matrix-like operations in frames –Merging Data Frames –Applying functions to Data frames –Factors and Tables –factors and levels –Common functions used with factors –Working with tables -Other factors and table related functions -Control statements –Arithmetic and Boolean operators and values –Default values for arguments -Returning Boolean values

Unit II

Packages in R

Tidyr, ggplot2, ggraph, dplyr, tidyquant, dygraphs

Introduction to Data analytics: Overview of Bigdata, Need of Data Analytics, Applications of Data Analytics, Datasets, tools for data analytics

Basic Statistics: Mean, Median, Standard Deviation, Variance, Correlation, Covariance

Unit III

Basic Analysis Techniques:

Chi-Square Test, t-Test, Analysis of Variance, Corrleation Analysis

Unit IV

Data Analysis Techniques

Linear Regression, Logistic Regression, Classification Techniques, Clustering Techniques, Ensemble   model

Unit V

Data Visualization Using R

Data Visualization, Libraries used for Data Visualization in R, Bar chart, Histogram, Heatmap, Scatter plot, Box Plot, Correlogram, Area Chart

Text Book:

1. Data Analytics using R, McGrawHill Publications, SeemaAcharya
2. R for Data Science: Import, Tidy, Transform, Visualize, and Model Databy Hadley Wickham , O'Reilly
3. Rumset D. J. (2010): Statistical Essentials for Dummies. Hoboken: Wiley Publishing

DATA ANALYTICS USING R LAB

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C14-P	DATA ANALYTICS USING R LAB	2	30	1

List of Experiments

1. R DataFrame: Create, Append, Select, Subset, Merging of dataframes

2. Exporting data to Excel, CSV,SAS, TextFile

3. Handling datasets

4. Mean, Median, Standard Deviation, Variance, Correlation, Covariance in R

5. Correlation in R:Pearson & Spearman with Matrix Example

6. T Test in R

7. Chi-Square Test in R

8. Prediction using linear regression and visualizing the regression graphically

9. Prediction using logistic regression and visualizing the regression graphically

10. Classification algorithms in R

11. Clustering algorithms in R

12. Scatter Plot in R using ggplot2

13. Boxplot in R

14. Barchart& Histogram in R

Object Oriented Software Engineering

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C15	Object Oriented Software Engineering	4	60	4

Course Objectives:
- Illustrate basic taxonomy and terminology of the software engineering.
- Plan and monitor the control aspects of project.

Course Outcomes:
- Explore the basic concepts of software engineering.
- Choose appropriate life cycle model for a project.
- Implement the phases of the traditional software development process.
- Design various test cases for a software product.
- Analyze different architectural views.

Syllabus

Unit –I **The Scope of Object Oriented Software Engineering**: Historical Aspects, Economic Aspects, Maintenance Aspects, Requirements, analysis and design aspects, the object oriented Paradigm, Terminology, Ethical Issues.

Software Life Cycle Models: Software Development t In Theory, Risks and other aspects of Iteration and Incrementation, Managing Iteration and Incrementation, other Life Cycle Models: Code and Fix, Waterfall, Rapid Prototyping, Open Source, Agile Processes, Synchronize and Stabilize, Spiral Models, Comparison of Life Cycle Models.

Unit-II **The Software Process** : The Unified Process, Iteration and Incrementation, The Requirements Workflow, The Analysis workflow, The Design Workflow ,The Implementation workflow, the test workflow, Post Delivery Maintenance, Retirement, the phases of the unified process, one-versus two-dimensional life

cycle models, improving the software process, capability maturity models, costs and benefits of software process improvement**.**

Teams : Team Organization, Democratic Team Approach, Chief Programmer Team Approach, Synchronize and Stabilize Teams, Teams for Agile processes, open source programming teams, people capability maturity model choosingan appropriateteam.

Unit-III   **Models to Objects**:   what is a module? Cohesion, Coupling, Data Encapsulation, Abstract Data Types, Information Hiding, Objects, Inheritance, Polymorphism and Dynamic Binding, The Object-Oriented Paradigm.

Reusability and Portability: Objects and Reuse, Reuse during design and implementation reuse and post delivery maintenance, portability, techniques for achieving portability.

Planning and Estimating: planning and the software process, Estimating duration and cost, components of a software project management plan, software project management plan framework, planning testing, training requirements, documentations standards.

Unit-IV   **The Requirements workflow**: Determining what client needs , overview of the requirements, understanding the domain, the business model, initial requirements, what are object-oriented requirements, rapid prototyping , human factors, reusing the rapid prototype, metrics for the requirement workflow, challenges of the requirements workflow.

The Analysis Workflow: The specification document, informal specifications, the analysis workflow, extracting the entity classes ,challenges of the analysis workflow.

The Design Workflow: Object –Oriented Design, the design workflow, formal techniques for detailed design, real time design techniques, CASE tools for design, metrics for design, challenges of the design workflow.

Unit-V   **The implementation workflow**: choice of programming languages, good programming practice, coding standards, code reuse, integration, the implementation workflow.

Testing: Quality Issues, Non – Execution based testing, execution based testing, what should be tested?, testing versus correctness proofs, who should perform execution based testing?, when testing stops. Test case selection, Black

Box Unit Testing techniques, Glass-Box Unit Testing Techniques, code walkthrough and inspections, comparison of unit testing techniques, clean room, testing issues integration testing, product testing, and acceptance testing metrics for the implementation workflow challenge of the implementation workflow.

Post delivery Maintenance: Why post delivery maintenance is necessary, what is required of post delivery maintenance programmers? Management of post delivery maintenance, maintenance issues, reverse engineering testing during post delivery maintenance metrics for post delivery maintenance, challenges for the post delivery maintenance.

TEXT BOOKS

	Author	Title	Publisher
1	Stephen R.Schach	Object Oriented Software Engineering	McGraw Hill Higher Education

REFERENCE BOOKS

	Author	Title	Publisher
1	Timothy C.Lethbridge, Robert Language	Object Oriented Software Engineering	McGraw Hill 2nd Education

Object Oriented Software Engineering Lab

Semester	Course Code	Course Title	Hours/Week	Hours	Credits
IV	C15-P	Object Oriented Software Engineering Lab	2	30	1

Practical Syllabus

List of Experiments

Case Studies:

Design Following Systems in Object Oriented Approach using UML with open source tools (Eclipse UML2 or any other Open source tools):

1. Online Examination System.

2 Online Railway Reservation.

3 Library Maintenance System.

4 Any E-Commerce Portal.

5 Biometric Attendance System.

Note: Student is expected to analyze the system in object oriented manner and design the system in object oriented approach using UML with open source tools