ETHIRAJ COLLEGE FOR WOMEN [AUTONOMOUS]
CHENNAI – 600 008

BACHELOR OF COMPUTER APPLICATIONS
(Self-Supporting)

SYLLABUS

CHOICE BASED CREDIT SYSTEM
OUTCOME BASED EDUCATION

OFFERED FROM THE ACADEMIC YEAR 2021-2022

CONTENTS

RULES AND REGULATIONS FOR THE PROGRAMME

ELIGIBILITY CRITERIA FOR ADMISSION

Candidates for admission into the first year of the Degree of Bachelor of Computer Applications course, shall be required to have passed the Higher Secondary Examinations [plus two] conducted by the Govt. of Tamil Nadu or an Examination accepted as equivalent thereto by the Syndicate of the University of Madras. The Candidate should have Mathematics / Business Mathematics / Statistics as one of the subjects in Higher Secondary Examinations.

ELIGIBILITY FOR THE AWARD OF THE DEGREE

A candidate shall be eligible for the award of the Degree only if she has undergone the prescribed course of study in the College for a period of not less than three academic years, passed the Examination of all the six semesters prescribed.

COURSE OF STUDY

The main subject for the Bachelor Degree shall consist of the following:

PART I   : Foundation Course - Languages
PART II   : Foundation Course – English
PART III   : Major and Allied Subjects
PART IV   : Non-Major Electives / Soft skills

DURATION

Each academic year is divided into two semesters. The first academic year shall comprise of the first and second semesters, the second academic year comprises of the third and fourth semesters and the third academic year comprises of the fifth and sixth semesters respectively. The odd semesters shall consist of the period from June to November of each year and the even semesters from December to April of each year. There shall not be less than 450 hours / 90 days for each semester and each day will have five working hours.

MEDIUM OF INSTRUCTION

The Medium of Instruction and Examination (Written and Viva Voce) shall be English.

PASSING MINIMUM

A candidate shall be declared to have passed in each paper/practical of the main subject of study wherever prescribed, if she secured NOT LESS than 40/100 in the Examination. She shall be declared to have passed the whole examination, if she passes in all papers and practical wherever prescribed as per the scheme of examination.

CLASSIFICTION OF SUCCESSFUL CANDIDATES

I Class, II Class, III Class

PROGRAMME EDUCATIONAL OBJECTIVES

On obtaining an undergraduate degree the students will be able to:

PEO1: Apply and advance the knowledge and skills acquired, to become a creative professional in their chosen field.

PEO2: Engage in self-directed continuous learning, aimed at global competency, which will promote professional and personal growth.

PEO3: Develop management skills and entrepreneurial skills, by harnessing core competencies tempered by values and ethics.

PEO4: Work towards achieving economic and social equity for women through application of relevant knowledge.

PEO5: Contribute to promoting environmental sustainability and social inclusivity.

PROGRAMME OUTCOMES

On completion of the Programme, the learner will be able to:

1. Promote and apply scientific knowledge for finding sustainable solution to real time problems.
2. Identify, Analyze and formulate novel ideas to yield sustainable results in the field of research utilizing the principle concepts of programming languages combined with theoretical knowledge of Computer applications.
3. Relate key concepts and principles of programming languages to various applications in Software industry.
4. Cultivate unparallel comprehension of fundamental concepts relevant to basic computing techniques leading to an individual progress and career advancement at the National and Global levels.
5. To communicate effectively their views and ideas orally/written in English and in other related languages.
6. Design solutions for complex problems and design system components or processes that meet the specific needs with appropriate consideration for public health and safety, cultural, societal and environmental conditions.

PROGRAMME SPECIFIC OUTCOMES

PSO 1: Demonstrate the ability to adapt to technological changes and innovations in the discipline

PSO 2: Analyze, design, implement and evaluate computerized solutions to real life problems using appropriate computing methods.

PSO 3: Develop skilled manpower in various areas of software industry.

PSO 4: Develop a small program for personal use and implementing a software product.

PSO 5: Possess strong foundation for their higher studies.

PSO 6: Blend analytical, logical and managerial skills with the technical aspects to resolve business challenges.

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS) CHENNAI -08

CURRICULUM (2021-22 ONWARDS)

UNDERGRADUATE PROGRAMME PROFILE

DEPARTMENT OF BCA

PART	CORE/ ALLIED/ ELECTIVE	TITLE OF THE PAPER	CODE	L	T	P	H	C	CA	SE	MM
I SEMESTER
I	Language	Tamil/Hindi/French/Sanskrit						3	40	60	100
II	English	Communicative English						3	40	60	100
III	Core 1	Data Structures and Programming in C++	CA21/1C/DSC	4	3	-	105	5	40	60	100
III	Practical 1	C++ and Data Structures Laboratory	CA21/1C/PR1	-	-	3	45	2	40	60	100
III	Allied	Statistics						5	40	60	100
IV	EVS	Environmental Studies					30	2	-	50	50
IV	Soft Skill	English Department-Professional English for Arts/ Commerce/ Physical Sciences/Life Sciences						3	-	50	50
II SEMESTER
I	Language	Tamil/Hindi/French/Sanskrit						3	40	60	100
II	English	Communicative English						3	40	60	100
III	Core 2	Programming in Java	CA21/2C/PJP	4	3	-	105	5	40	60	100
III	Practical 2	Java Laboratory	CA21/2C/PR2	-	-	3	45	2	40	60	100
III	Allied	Operations Research						5	40	60	100
IV	Val. Ed	Value Education					30	2	-	50	50
IV	Soft Skill	English Department-Professional English for arts/ Commerce/ Physical Sciences/Life Sciences						3	-	50	50
III SEMESTER
I	Core 3	Computer Graphics	CA21/3C/CCG	3	1	-	60	3	40	60	100
II	Core 4	Web Development with PHP and MySQL	CA21/3C/WPM	3	1	-	60	3	40	60	100
III	Core 5	Database Management Systems	CA21/3C/DBS	3	1	-	60	3	40	60	100
III	Practical 3	Computer Graphics using C Laboratory	CA21/3C/PR3	-	-	3	45	2	40	60	100
IV	Practical 4	PHP and MySQL Laboratory	CA21/3C/PR4	-	-	5	75	3			
V	Allied	Financial Accounting	CA21/3A/CFA	5	1	-	90	5	40	60	100
VI	NME (1c)	World Wide Web Design with HTML	CA21/3N/WWH	-	-	2	30	2	-	50	50
VII	Soft Skill	English Department-Professional English for Arts/Commerce/Physical Sciences/Life Sciences						3	-	50	50
IV SEMESTER
I	Core 6	Python for Data Science	CA21/4C/PDS	3	1	-	60	3	40	60	100
II	Core 7	Operating System	CA21/4C/COS	3	1	-	60	3	40	60	100
III	Core 8	Introduction to Machine Learning	CA21/4C/IML	3	1	-	60	3	40	60	100
IV	Practical 5	Python and Data Science Laboratory	CA21/4C/PR5	-	-	5	75	3	40	60	100
V	Project 1	Term paper and Seminar	CA21/4C/PO1	-	-	3	45	2	40	60	100
VI	Allied	Management Accounting	CA21/4A/CMA	5	1	-	90	5	40	60	100
VII	NME (1c)	Data Analytics Using Excel	CA21/4N/DAE	-	-	2	30	2	-	50	50

				L	T	P	H	C	CA	SE	MM
VIII	Soft Skill	English Department-Professional English for Arts/Commerce/Physical Sciences/Life Sciences		2	-	-	30	3	-	50	50
V SEMESTER											
I	Core 9	Dot Net Technologies	CA21/5C/DNT	3	2	-	75	4	40	60	100
II	Core 10	Software Engineering	CA21/5C/CSE	3	2	-	75	4	40	60	100
III	Core 11	Data Mining using R	CA21/5C/DMR	3	2	-	75	4	40	60	100
IV	Elective I	Artificial Intelligence and Expert System	CA21/5E/AES	3	2	-	75	4	40	60	100
		Object Oriented Analysis and Design (MOOC)	CA21/5E/OAD	3	2	-	75	4	40	60	100
V	Practical 6	Data Mining using R Laboratory	CA21/5C/PR6	-	-	5	75	3	40	60	100
VI	Practical 7	Dot Net Laboratory	CA21/5C/PR7	-	-	5	75	3	40	60	100
VI SEMESTER											
I	Core 12	Data Communications and networking	CA21/6C/DCN	3	2	-	75	4	40	60	100
II	Core 13	Android Programming	CA21/6C/ANP	3	2	-	75	4	40	60	100
III	Core 14	Big Data Analytics	CA21/6C/BDA	3	2	-	75	4	40	60	100
IV	Elective II	Internet of Things	CA21/6E/IOT	3	2	-	75	4	40	60	100
		Cloud Computing (MOOC)	CA21/6E/CCT	3	2	-	75	4	40	60	100
V	Practical 8	Android Programming Lab	CA21/6C/PR8	-	-	5	75	3	40	60	100
VI	Project 2	Mini Project	CA21/6C/PO2	-	-	5	75	4	40	60	100
		Extension Activity (Sports/NCC/NSS/CSS/ YRC/RRC/Retract/Yoga) Min 60 hours		-	-	-	-	1	-	-	-
					Total Credits			140			
		OPTIONAL EXTRA CREDITS									
I		**Self-Study - Semester V**									
		Computer Vision	CA21/5SS/CCV	-	-	-	-	2	-	100	100
		Deep Learning	CA21/5SS/DPL	-	-	-	-	2	-	100	100
		Design and Analysis of Algorithm	CA21/5SS/DAA	-	-	-	-	2	-	100	100
II		Internship – End of semester IV	CA21/5SS/INT	-	-	-	-	2	-	100	100

L = Lecture Hours

T = Tutorial Hours

P=Practical Hours

H = Hours per week

C= Credits

CA=Continuous Assessment

SE= Semester Examinations

MM=Maximum Marks

EVALUATION PATTERN FOR CONTINUOUS ASSESSMENT

PART I , II , III – THEORY PAPERS :-

Continuous Assessment				
Test I (2hrs)	Test II (2hrs)	Quiz	Participatory Learning	Total
10	10	10	10	40

PART III – PRACTICAL PAPERS:

Continuous Assessment				
Test I (2hrs)	Test II (2hrs)	Record work	Participatory Learning	Total
10	10	10	10	40

PART III: TERM PAPER AND SEMINAR / MINI PROJECT:

Documentation	Review I	Review II	Total
20	10	10	40

CA QUESTION PAPER PATTERN: PART I, II, III – THEORY PAPERS: -

Knowledge Level	Section/Mark	Word limit	Marks	Total	Time	Special instructions if any
K1	A - 3 X 2	50	6			
K1, K3	B - 3/4 X 8	250	24	50	2 Hrs.	-
K2, K3	C - 1/2 X 20	500	20			

RUBRICS FOR CONTINIOUS ASSESSMENT EVALUATION

Assignment	Content/originality/Presentation/Schematic Representation and Diagram/Bibliography
Seminar	Organization/Subject Knowledge/Visual Aids/Confidence level/presentation-Communication and Language
Field Visit	Participation/Preparation/Attitude/Leadership
Quiz	Understanding/Concept/Logical sequence/Analysis/Problem solving
Participation	Answering Questions/Clearing Doubts/Participating in Group Discussions/Regular Attendance
Case Study	Finding the Problem/Analysis/Solution/Justification
Problem Solving	Understanding Concepts/Formula and Variable Identification/Logical Sequence/Answer
Group Discussion	Preparation/Situation Analysis/Relationship Management/Information Exchange/Delivery Skills
Flipped/Blended Learning	Preparation/Information Exchange/Group interaction/Clearing doubts

EVALUATION PATTERN FOR END SEMESTER

PART I, II, III – THEORY PAPERS (Semester I, II, III, IV, V, VI):

Time   :3 hours.

Maximum Marks   : 100 [to be converted to 60 marks]

Double evaluation by Course teacher and External Examiner. Pass mark is 40.

III - PRACTICAL (Semester I, II, III, IV, V, VI):

Time   : 3 Hours
Maximum Marks   60
Double evaluation by Course teacher and External Examiner. Practical Questions selected by an External Examiner from a Question bank prepared by the department will be given to students to write programs and to execute the same.

TERM PAPER AND SEMINAR VIVA-VOCE:

Maximum Marks   60
Power point presentation along with documentation of Term paper will be submitted and presented for Viva-Voce.

MINI PROJECT VIVA-VOCE:

Maximum Marks   60
Software developed along with Documentation will be submitted for Viva-Voce.

INTERNSHIP:

Maximum Marks   100
Internship done for a minimum period of 14 days with a certificate and document submission for Viva-Voce.

PRACTICAL ORIENTED SKILL BASED NME:

Practical test for two hours for 50 marks will be conducted at the end of the semester

END SEMESTER QUESTION PAPER PATTERN:

THEORY PAPERS:

Knowledge Level	Section/Mark	Word limit	Marks	Total	Time	Special instructions if any
K1	A - 10 X 2	50	20			
K1,K3	B - 5/7 X 8	250	40	100	3 Hrs.	-
K2,K3	C - 2/4 X 20	500	40			

COURSE PROFILE SEMESTER I

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/1C/DSC	Data Structures and Programming in C++	5	7	105	4	3	-	40	60	100
CA21/1C/PR1	C++ and Data Structures Laboratory	2	3	45	-	-	3	40	60	100

SEMESTER I

BRIDGE COURSE TITLE	HOURS
Introduction to C Programming	8

Course Objective:

Enable the students to
1. Introduce C Programming language concepts
2. Develop C Programs

Course Outline:

Introduction of C – Data Types – Control Structures – Pointers – Simple Program writing

SEMESTER I

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/1C/DSC	Core: Data Structures and Programming in C++	5	7	105	4	3	-	40	60	100

Course Objective:

Enable the students to

1. Develop C++ programs.
2. Analyze data structures concepts
3. Solve real world problems using C++ language
4. Implement data structure concepts using C++
5. Implement concepts like arrays, structures, files using C++

Course Outline:

UNIT I:

Definition of a Data structure - Arrays: Linear array, Representation of linear array in memory-Traversing linear array-Insertion and Deletion. Linked Lists: Representation of Linked lists in memory-Traversing a Linked List-Searching a Linked List -Insertion into a Linked List-Deletion from a Linked List-Application: Polynomial Addition. Doubly Linked List: Insertion and Deletion.   [20   Hours]

Unit II:

Stacks: Representation of Stacks Using Array –Push and Pop Operations-Applications: Infix to Postfix Conversion, Recursion. Queues: Representation of Queues-Enqueue and Dequeue Operation. Trees: Introduction-Binary Trees-Representing Binary Trees in Memory-Traversing Binary Tree (Recursive Procedure). Graph: Representations of Graph- Traversing: BFS and DFS.   [20   Hours]

Unit III:

Software Crisis - Software Evaluation - OOP Paradigm - Basic Concepts of OOP - Benefits of OOP - Application of OOP- Introduction to C++ - Tokens - Keywords - Identifiers - Variables - Operators - Manipulators - Expressions and Control Structures - Functions - Function Prototyping - Parameters Passing in Functions - Values Return by Functions - Inline Functions–Recursion-Function Overloading.[20 Hours]

Unit IV:

Classes and objects – Constructors and Destructors – Operator Overloading and Type Conversions – Inheritance – Pointers, Virtual Functions and Polymorphism.   [25 Hours]

Unit V:

Managing Console, I/O Operations – Files – File operations – File pointer – Error Handling during file operations – Command line arguments.   [20 Hours]

Recommended Text Books

S. No	Title of the book	Authors	Publishers / Edition	Year of publications
1	Schaum's Outlines Data Structures	Seymour Lipschutz	Mc Graw Hill	2014
2	Data Structures, Algorithms and Applications in C++	Sartaj Sahni	University Press	2004
3	Object Oriented Programming with C++	E. Balaguruswamy	Tata McGraw-Hill publications 7th edition	2018

Reference Books:

S. No	Title of the book	Authors	Publishers / Edition	Year of publications
1	Fundamentals of Data structures in C++	E. Horowitz and S. Shani	Galgotia Pub	1999
2	Computer Algorithms,	Horowitz S. Shani, and S. Rajasekaran	Galgotia Pub	2016
3	Data Structures	A Chitra and P T Rajan	Nicoles Pvt Ltd.	2016
4	An introduction to Data Structures with applications	Jean-Paul Tremblay, Paul G. Sorenson	TMH	2000
5	Object Oriented Programming in Microsoft C++	Robert Lafore	Galgotia	1993

E-Learning Resources:

S.No.	URL
1	www.tutorialspoint.com/data_structures_algorithms/index.htm
2	https://www.udemy.com/topic/data-structures/free/
3	https://www.udemy.com/course/free-learn-c-tutorial-beginners/
4	www.cplusplus.com

Course Outcome :

CO No.	CO Statement
1	Design algorithms using data structures concepts
2	Implement data structure concepts like stacks, queues, trees and graphs
3	Identify the basic concepts in C++
4	Apply concepts like virtual functions and polymorphisms
5	Explain about the uses of files in C++

Mapping of Course Outcome with Programme Specific Outcome

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	2
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	3	3	3	3	3	2.8

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Chalk and Talk, OHP, LCD, Seminar, Discussion, Quiz, Program writing.

Question paper Pattern:

Knowledge Level	Section/Mark	Word limit	Marks	Total	Time	Special instructions if any
K1	A - 10 X 2	50	20	100	3 Hours	-
K1, K3	B - 5/7 X 8	250	40			
K2, K3	C - 2/4 X 20	500	40			

SEMESTER I

Course Code	Course Name	Credits	Hours/Week	Total Hours	L	T	P	CA	SE	Total
CA21/1C/PR1	Practical 1: C++ and Data Structures Laboratory	2	3	45	-	-	3	40	60	100

Course Objective:

Enable the students to

1. Develop C++ programs.
2. Read, understand and trace the execution of a program related to data structures
3. Solve real world problems using C++ language
4. Debug logical and syntax errors
5. Implement concepts like arrays, structures, files using C++
6. Implement data structure concepts like stack, queues, linked list and trees.

Course Outline:

1. Objects, classes.

2. Inheritance

3. Polymorphism.

4. Operator overloading.

5. Data type conversion.

6. Constructors, Pointers.

7. Virtual functions.

8. Friend Functions.

9. STACK implementation

10. QUEUE implementation

11. SINGLY LINKED LIST implementation

12. DOUBLY LINKED LIST implementation

13. TREE TRAVERSAL implementation

Course Outcome:

CO No.	CO Statement
1	Implement inheritance and polymorphisms concepts using C++ programs
2	Apply the concepts of constructors, virtual functions and operator overloading in programs
3	Design friend functions concepts
4	Demonstrate programs stack and queue concepts using C++
5	Develop programs to implement singly, doubly linked list and tree concepts using C++

Mapping of Course Outcome with Programme Specific Outcome

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Practical demonstrations, Discussion, Program writing.

Question paper Pattern:

Knowledge Level	Section/Mark	Marks	Total	Time
K2, K3, K4, K5, K6	A - 2 X 30	60	60	3 Hours

COURSE PROFILE SEMESTER II

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/2C/PJP	Programming in Java	5	7	105	4	3	-	40	60	100
CA21/2C/PR2	Java Laboratory	2	3	45	-	-	3	40	60	100

SEMESTER II

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/2C/PJP	Core: Programming in Java	5	7	105	4	3	-	40	60	100

Course Objectives:

Enable the students to

1. impart knowledge about the basic concepts of OOPS and overview & evaluation of Java.
2. use the concepts of Classes, Inheritance, Packages and Interfaces.
3. learn exception handling, multithreading and string handling concepts in Java.
4. inculcate knowledge about I/O concepts in Java.
5. understand applet and event handling programming with HTML and to explore the Java Swing and Java Bean.

Course Outline:

Unit-I:

Introduction - Role of JAVA in Internet - Features - Overview of Java - Data Types, Variables, Arrays

[15 Hours]

Unit-II:

Operators - Control statements – Classes, Methods – Inheritance – Packages and Interfaces

[25 Hours]

Unit-III:

Exception Handling - Multithreaded Programming - String Handling – Wrapper Classes

[20 Hours]

Unit-IV:

I/O Basics - Stream Classes – Byte Stream – Character Stream – Reading Console Input – Writing Console Output – Print Writer Class – Reading and writing Files   [20 Hours]

Unit-V:

The Applet Class – Event Handling - Java Beans – Advantages – Bean Developer Kit – JAR Files – Developing Simple Bean – JAVA Swing   [25 Hours]

Recommended Textbooks:

S.No.	Title of the Book	Authors	Publishers	Year of Publication
1.	Java 2 – The Complete Reference.	Hebert Schildt	Tata McGraw Hill Publications.	Fifth Edition, 2002

Reference Books:

S. No	Title of the book	Authors	Publishers / Edition	Year of publications
1	Programming with Java A Primer	E. Balaguruswamy	Tata McGraw Hill Publications	Sixth Edition 2019
2	Programming with Java,	John R. Hubbard	Tata McGraw Hill Publications	Fourth Edition2004

E-Learning Resources:

1	www.javatpoint.com
2	https://onlinecourses.nptel.ac.in/noc21_cs03/preview
3	https://www.edureka.co/blog/java-tutorial/
4	https://www.udemy.com/topic/java/
5	https://beginnersbook.com/java-tutorial-for-beginners-with-examples

Course Outcomes:

CO No.	CO Statement
1	Discuss the basic oops concept, evaluation and implementationoverview of java.
2	Design the applications using classes, inheritance, packages and interface.
3	Use the exception handling, multithreading and string handling concepts in various applications.
4	Demonstrate knowledge about I/O concepts in Java.
5	Able to perform applet programming designing HTML, Java Swing and Java Bean based programs.

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Chalk and Talk, OHP, LCD, Seminar, Discussion, Peer Learning.

Question Paper Pattern:

Knowledge Level	Section/Mark	Word Limit	Marks	Total	Time	Special instructions if any
K1	A – 10 x 2	50	20			
K1, K3	B – 5/8 x 8	250	40	100	3 Hrs.	
K2, K3	C – 2/4 x 20	500	40			

SEMESTER II

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/2C/PR2	Practical 2: Java Laboratory	2	3	45	-	-	3	40	60	100

Course Objectives:

Enable the students

1. To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.

2. To understand the importance of Classes & objects along with constructors, Arrays and Vectors.

3. To discuss the principles of inheritance, interface and packages and demonstrate though problem analysis assignments.

4. To understand importance of multi-threading & different exception handling mechanisms.

5. To learn experience of graphical user interfaces in Java using applet and AWT that respond to different user events, creating Java Swing elements and Java Bean.

Course Outline:

1. Classes and objects
2. Arrays
3. Vectors
4. Thread
5. Exception handling
6. Inheritance
7. Interfaces
8. Packages
9. Applet Program
10. Event Handling
11. File Handling
12. JDBC
13. Java Beans Components
14. Swing Components

Course Outcomes:

CO No.	CO Statement
1	Able to understand concept of Object-Oriented Programming & JavaProgramming constructs.
2	Able to understand basic concepts of Java such as operators, classes, objects, inheritance, packages and Enumeration
3	Able to understand the concept of exception handling and Input/output operations
4	Able to design the application of Java and Java applet
5	Able to design the concept of Event Handling, Abstract windows toolkit, Java Bean and Java Swing.

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	2
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	3	3	3	3	3	2.8

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Practical demonstrations, Discussions, Program writing.

Question paper Pattern:

Knowledge Level	Section/Mark	Marks	Total	Time
K2,K3,K4,K5,K6	A - 2 X 30	30	60	3 Hours

COURSE PROFILE SEMESTER III

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/3C/CCG	Computer Graphics	3	4	60	3	1	-	40	60	100
CA21/3C/WPM	Web Development with PHP and MySQL	3	4	60	3	1	-	40	60	100
CA21/3C/DBS	Database Management Systems	3	4	60	3	1	-	40	60	100
CA21/3A/CFA	Allied: Financial Accounting	5	6	90	5	1	-	40	60	100
CA21/3C/PR3	Computer Graphics using C Laboratory	2	3	45	-	-	4	40	60	100
CA21/3C/PR4	PHP and MySQL Laboratory	3	5	75	-	-	3	40	60	100

Course Code	Course Name	Credits	Hours /Week	Total Hours	L	T	P	CA	SE	Total
CA21/3C/CCG	Core: Computer Graphics	3	4	60	3	1	-	40	60	100

Course Objectives:

Enable the students to

1. Import knowledge about graphics display devices.
2. Study the graphics algorithms.
3. Introduce two dimensional and three-dimensional transformations.
4. Explore two dimensional and three-dimensional viewing.
5. Study Hidden surface and hidden lines removal

Course Outline:

Unit - I:
Introduction to computer Graphics - Video display devices- Raster Scan Systems -Random Scan Systems – Input devices - Hard copy devices - Graphics software – Points and lines - Line drawing algorithms - Line function - Circle Generating algorithms.   [10 Hours]

Unit - II
Attributes of output Primitives - Line attributes - Color and Grayscale style - Area fil attributes - Character attributes- Bundled attributes- Inquiry functions - Two dimensional geometric transformations - Basic transformations - Composite transformations - Matrix representations - Other transformations.   [15 Hours]

Unit - III
Two - dimensional viewing - Window- to view port co-ordinate transformation - Clipping operations and algorithms - Interactive input methods - Logical classification of input devices - Interactive picture construction techniques.   [10 Hours]
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Unit - IV
Three - dimensional concepts - Three-dimensional display methods - Parallel Projection - Perspective Projection - Depth Cueing - Visible line and surface identification -Three dimensional transformations.   [15 Hours]

Unit - V
Three-dimensional viewing – Viewing Pipeline - Projection - Viewing transformation - implementation of viewing operations - Hidden surface and Hidden line removal - Back face removals.   [10 Hours]

Recommended Textbooks:

S. No	Title of the Book	Authors	Publishers	Year of Publication
1	Computer Graphics	D.Hearn and M.P. Baker	Prentice Hall of India	2011.

Reference Books:

S. No	Title of the Book	Authors	Publishers	Year of Publication
1	Principles of Interactive Computer Graphics	W.M. Newman and RF. Sproull	McGraw Hill International Edition	2001.

E-Learning Resources:

S. No	URL
1	http://www.tutorialspoint.com/computer_graphics/
2	https://www.javatpoint.com/computer-graphics-tutorial
3	https://inspirit.net.in/books/academic/Computer%20Graphics%20C%20Version%20-%20Hearn%20&%20Baker.pdf

Course Outcomes:

CO No.	CO Statement
CO 1	Utilize the basic components in computer graphics
CO 2	Demonstrate various algorithms like line drawing and circle drawing
CO 3	Apply 2D and 3D transformations
CO 4	Learn viewing and clipping
CO 5	Understand hidden surface and hidden line removal

Mapping of Course Outcome with Programme Specific Outcome:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	1	3	2	3	3
CO 2	3	3	3	3	3	2
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	2
CO 5	3	3	3	3	3	1
AVERAGE	3	2.6	3	2.8	3	2.2

Key: **S**trongly Corelated-3 Moderately Corelated - 2 Weakly Corelated - 1 No Correlation -0

Teaching Methodology:

Lecture by chalk and talk, OHP, e- content, Problem Solving, Group Discussion.

Question Paper Pattern:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instruction if any
K1	A – 10 x 2 Marks	50	20		
K1, K3	B – 5/7 x 8 Marks	250	40	100	
K2, K3	C – 2/4 x 20 Marks	500	40		

SEMESTER III

Course Code	Course Name	Credits	Hours / Week	Total Hours	L	T	P	CA	SE	Total
CA21/3C/WPM	Core: Web Development with PHP and MySQL	3	4	60	3	1	-	40	60	100

Course Objectives:

Enable the students to
1. Inculcate knowledge on designing webpage using HTML and DHTML
2. Study the creation of interactive web pages using PHP.
3. Develops the skills to create server-side scripts using PHP.
4. Create a dynamic website using PHP and MySQL.
5. Implement MySQL commands through PHP.

Course Outline:

Unit - I
Introduction: Introduction to HTML – List - Adding Graphics to HTML Doc - Creating Table - Linking document - Frames –Dynamic HTML: Cascading Style sheets - Style sheet basic - Add style to document – Font Attributes, Color and Background Attributes, Text Attributes, Border Attributes, Margin Related Attributes and List Attributes – Class – Using the <SPAN>…. </SPAN>Tag - External Style sheets – Using the <DIV>.... </DIV> Tag.   [10 Hours]

Unit - II
PHP: Introducing PHP – How to write and run the PHP Script - Basics of PHP Scripts: Data types – Variables – Constants - HERE Documents – Operators – Arrays - Conditional Statement - Iterations – Functions: User-Defined Functions – Built-in Functions – PHP Server Variables - Working with Date and Time – Performing Mathematical Operations - Working with Strings Functions.
                                                         [15 Hours]

Unit - III
Working with Forms: Form Elements – Adding Elements to a Form – Uploading Files to the Web Server Using PHP – Regular Expressions: Uses of Regular Expressions – Types of Regular Expressions – Symbols Used in Regular Expressions – Using Regular Expression Functions – Debugging and Errors: Good Programming Practices – Error Handling in PHP – Logging Errors – Ignoring Errors – Acting on Errors / Exceptions.   [10 Hours]

Unit – IV
Working with Cookies and User Sessions – Working with Files and Directories – Working with Images.   [10 Hours]

Unit –V
PHP and MySQL Integration: Understanding the Database Design Process - Learning Basic SQL Commands – Using Transactions and Stored Procedures in MySQL - Interacting with MySQL Using PHP.   [15 Hours]

Recommended Textbooks:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Web Enable Commercial Application Development Using HTML, JavaScript, DHTML and PHP	Ivan Bayross	BPB	4th Revised Edition 2010
2.	Sam's Teach Yourself, PHP, MySQL and Apache	Julie C. Meloni	Pearson	5th Edition 2012

Reference Books:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Complete Reference HTML	T. A. Powell	TMH	2010
2.	Web Technology & Design	C.Xavier	New Age International	2018
3.	Learning PHP, MySQL, JavaScript, CSS & HTML5	Robin Nixon	O'Reilly	3 Edition 2014

E-Learning Resources:

1	http:// www.w3schools.com/php
2	http:// www.tutorialspoint.com/php/
3	http://nptelvideos.com/php/php_video_tutorials.php

Course Outcomes:

CO No.	CO Statement
CO 1	Use knowledge of HTML and CSS code to create personal or business websites following current professional or industry standards.
CO 2	Discuss the concepts of PHP and its advantages over other languages.
CO 3	Analyze the basic structure of a PHP web application
CO 4	Create, backup and restore a MYSQL database and to apply their knowledge to the creation of dynamic web applications.
CO 5	Outline the principles behind using MySQL as a backend DBMS with PHP

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
AVERAGE	**3**	**3**	**3**	**3**	**3**	**3**

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1,
No Correlation - 0

Teaching Methodology:

Lecture (Chalk and Talk), Problem Solving, E-Content, Peer Learning, Group Discussion, Seminar.

Question Paper Pattern:

Knowledge Level	Section	Word Limit	Marks	Total	Time
K1	A – 10 x 2 Marks	50	20		
K1, K2	B – 5/7 x 8 Marks	250	40	100	3HRS
K2, K3	C – 2/4 x 20 Marks	500	40		

Course Code	Course Name	Credits	Hours/Week	Total Hours	L	T	P	CA	SE	Total
CA21/3C/DBS	Core: Database Management Systems	3	4	60	3	1	-	40	60	100

Course Objective:

Enable the students to

1. Enhance knowledge about DBMS and RDBMS concepts
2. Normalize data before creating database
3. Write queries using SQL
4. Write complex queries to solve real world problems
5. Enrich knowledge about the concepts of database security

Course Outline:

Unit - I:

Introduction to Database Management Systems - Introduction to Relational Database Management Systems - Database Architecture and Data Modeling: Conceptual, Physical and Logical Database Models – Design Constraints.   [10 Hours]

Unit - II:

Entity - Relationship (E-R) Modeling - Data Normalization - Relational Algebra and relational Calculus.   [15 Hours]

Unit - III:

Introduction to Structured Query Language – Tables - Views and Indexes - Queries and Sub Queries
                                    [15 Hours]

Unit - IV:
Aggregate Functions - Insert, Update and Delete Operations - Joins and Unions - Query-by-Example (QBE).   [10   Hours]

Unit - V:
Database Security: Data Security Risks - Data security requirements - Database users - Protecting

the data within the database - Granting and revoking privileges and roles. Data Integrity. [10 Hours]

Recommended Text Books

S. No	Title of the book	Authors	Publishers / Edition	Year of publications
1	Database Management Systems	Alexis Leon, Mathews Leon	Vikas Publications	2002

Reference Books:

S. No	Title of the book	Authors	Publishers / Edition	Year of publications
1	Database System Concepts	Abraham Silberschatz, Hendry F. Korth	Tata McGraw Hill Seventh Edition	1997
2	Database Systems Using ORACLE	Nilesh Shah	PHI Second edition	2009

E-Learning Resources:

S.No.	URL
1	www.smart-soft.co.uk/Oracle/oracle-tutorial.html
2	www.oracle-dba-online.com/sql/oracle_sql_tutorial.html
3	www.javatpoint.com/oracle-tutorial
4	www.tutorialspoint.com/dbms/index.html
5	https://nptel.ac.in/courses/106/105/106105175/

Course Outcomes:

CO No.	CO Statement
1	Apply Data modeling and constraints in database
2	Explain about data normalization
3	Apply the concepts of SQL programming
4	Demonstrate the use of complex queries using aggregate functions and joins
5	Design database using data integrity and data security

Mapping of Course Outcome with Program Specific Outcome:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Chalk and Talk, OHP, LCD, Seminar, Discussion, Quiz, Program writing.

Question paper Pattern:

Knowledge Level	Section/Mark	Word limit	Marks	Total	Time	Special instructions if any
K1	A - 10 X 2	50	20			
K1, K3	B - 5/7 X 8	250	40	100	3 Hrs.	-
K2, K3	C - 2/4 X 20	500	40			

SEMESTER III

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/3A/CFA	Allied – Financial Accounting	5	6	90	5	1	-	40	60	100

Course Objectives:

Enable the students to

1. Inculcate basic accounting Knowledge.
2. Explain the steps how to record the transaction in Financial Accounting.
3. Understand information contained in the published financial statements of companies and other organizations.
4. Prepare the Final Account with adjustments.
5. Study the concept of depreciation.

Course Outline:

Unit - I:
Introduction to Accounting: Definition - Attributes and Steps of Accounting -Objectives, Advantages and Limitations - Groups interested in Accounting Information - Branches of Accounting - Methods of Accounting - Types of Accounts-Accounting Rules. Basic Accounting Concepts and Conventions - Accounting Equation. [15 Hours]

Unit - II:
Journal – Transaction analysis for Journal Entries – Ledger – Account – Posting of Journal to Ledger – Balancing of Ledger Accounts – Cash Book – Simple Cash book – Two column cash book with cash and discount columns – Two column cash book with bank and discount columns – Three column cash book. [15 Hours]

Unit - III :
Trial balance – Rectification of Errors – Suspense Account – Bank Reconciliation Statement. [20 Hours]

Unit IV:
Final Accounts: Trading Account – Profit and Loss Account – Balance Sheet – Adjustments. [20 Hours]

Unit - V:
Depreciation Accounting: Meaning – Characteristics – Causes – Methods of recording Depreciation – Methods of providing depreciation – Fixed percentage on original cost – Fixed percentage on diminishing balance (including change in the method of depreciation). [20 Hours]

Recommended Textbooks:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Financial Accounting	T.S. Reddy, A. Murthy	Margham	2018

Reference Books:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Advanced Accountancy	Gupta R.L., M. Radha swamy	Sultan Chand & Sons	2018
2.	Financial Accounting	S. Manikandan	SciTech	2011

E-Learning Resources:

1	http://www.tutorialspoint.com/financial_accounting
2	https:// www.accountingverse.com/financial_accounting
3	https://www.tutorialpoint.com/accounting_basics/index.html
4	https://www.tutorialkart.com/accounting/accounting-tutorial/

Course Outcomes:

CO No.	CO Statement
CO 1	State the uses and users of accounting information
CO 2	Able to record basic accounting transactions
CO 3	Analyze, interpret and communicate the information contained in basic financial statements and also explain the limitations
CO 4	Describe the main elements of financial accounting information – assets, liabilities, revenue and expenses
CO 5	Compute the different types of depreciation and their purposes.

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	2	3	1	1	1
CO 2	1	1	2	1	2	2
CO 3	1	2	1	2	1	3
CO 4	1	2	3	2	2	3
CO 5	1	1	2	2	2	3
AVERAGE	1	1.6	2.2	1.6	1.6	2.4

Key: Strongly Correlated – 3, Moderately Correlated –   2, Weakly Correlated – 1,
       No Correlation - 0

Teaching Methodology:

Lecture (Chalk and Talk), Problem Solving, Group Discussion, Assignment, Quiz, Seminar.

Question Paper Pattern:

Knowledge Level	Section	Word Limit	Marks	Total	TIME
K1	A – 10 x 2 Marks	50	20		
K1, K2	B – 5/7 x 8 Marks	250	40	100	3HRS
K2, K3	C – 2/4 x 20 Marks	500	40		

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/3C/PR3	Practical 3: Computer Graphics using C++ Laboratory	2	3	45	-	-	3	40	60	100

Course Objectives:

Enable the students to
1. Understand the need of developing graphics application.
2. Learn algorithmic development of graphics primitives like: line, circle,
3. Introduce representation and transformation of graphical images and pictures.
4. Explore two dimensional and three-dimensional composite transformations.
5. Introduce clipping.

Course Outline:

1. Drawing an Image using Geometric Functions.

2. Implementation of DDA Algorithm

3. Implementation of Bresenhams Line Drawing Algorithm

4. Implementation of Bresenhams Circle Drawing Algorithm

5. Two Dimensional transformations - Translation, Rotation, Scaling, Reflection

6. Composite 2D Transformations

7. Implementation of Cohen Sutherland 2D line clipping Algorithm.

8. Three dimensional transformations - Translation, Rotation, Scaling

9. Composite 3D transformations

Course Outcomes:

CO No.	CO Statement
CO 1	Create simple graphics applications
CO 2	Analyze Geometric primitives
CO 3	Demonstrate transformation of graphical images and pictures
CO 4	Explain composite transformations on objects
CO 5	Prepare clipping algorithm on lines

Mapping of Course Outcome with Programme Specific Outcome:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
CO 6	3	3	3	3	3	3
AVERAGE	3	3	3	3	3	3

Key: **S**trongly Corelated-3 Moderately Correlated - 2 Weakly Correlated - 1 No Correlation -0

Teaching Methodology:

Practical Demonstrations, Discussion, Program writing.

Question Paper Pattern:

Knowledge Level	Section/Mark	Marks	Total	Time
K2, K3, K4, K5, K6	A – 2 X 30	60	60	3 Hours

SEMESTER-III

Course Code	Course Name	Credits	Hours /Week	Total Hours	L	T	P	CA	SE	Total
CA21/3C/PR4	Practical 4: PHP and MySQL Laboratory	3	5	75	-	-	5	40	60	100

Course Objective:

Enable the students to
1. Implement HTML commands and Cascading Style Sheets.
2. Implement PHP scripts to handle HTML Forms.
3. Implement Regular Expressions including modifiers, operators and metacharacters.
4. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
5. Analyze and solve various database concept and web application tasks by writing PHP programs.

Course Outline:

Creation of web pages using:
1. Array
2. String Function
3. Data and Time function
4. Mathematical operations
5. Forms
6. Regular Expressions
7. Upload the image
8. Error handling in PHP
9. Cookie
10. Session
11. files and directories
12. Database Connectivity

Course Outcome:

CO No.	CO Statement
CO 1	Implement the basic HTML commands, hyperlinks and Cascading Style sheets.
CO 2	Illustrate the web PHP concept to create dynamic web pages.
CO 3	Analyze and solve various database tasks using PHP Language.
CO 4	Apply MySQL commands to solve common web application tasks by writing PHP Programs.
CO 5	Design and develop a complete website through the hands-on experience.

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
AVERAGE	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Practical demonstrations, Discussion, Program writing.

Question Paper Pattern:

Knowledge Level	Section/Mark	Marks	Total	Time
K2, K3, K4, K5, K6	A – 2 X 30	60	60	3 Hours

COURSE PROFILE SEMESTER IV

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/4C/PDS	Python for Data Science	3	4	60	3	1	-	40	60	100
CA21/4C/COS	Operating System	3	4	60	3	1	-	40	60	100
CA21/4C/IML	Introduction to Machine Learning	3	4	60	3	1	-	40	60	100
CA21/4A/CMA	Management Accounting	5	6	90	5	1	-	40	60	100
CA21/4C/PR5	Python and Data Science Laboratory	3	5	75	-	-	5	40	60	100
CA21/4C/PO1	Term paper and Seminar	2	3	45	-	-	3	40	60	100

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/4C/PDS	Core: Python for Data Science	3	4	60	3	1	-	40	60	100

Course Objectives:

Enable the students to
1. Inculcate the knowledge about fundamentals of Data Science and the concept of Data Preprocessing.
2. Introduce data plotting and Visualization method.
3. Illustrate the process of structuring the data using lists, dictionaries, tuples & sets and built-in functions to navigate the file system.
4. Perform high-level mathematical computing using the NumPy package.
5. Perform data analysis and manipulation using data structures and tools provided in the Pandas package.

Course Outline:

Unit – I

Fundamentals of Data Science: Introduction – Why learn Data science? – Data Analytics lifecycle – Types of Data analysis – Types of jobs in Data Analytics – Data Science Tools – Fundamental areas of study in data science – Role of SQL in data science – Pros and Cons of Data Science.   [10 Hours]

Unit - II

Data Preprocessing: Introduction – Data types and forms – Possible data error types - Various data preprocessing operations; Data plotting and Visualization: Introduction – Visual encoding – Data visualization software – Data Visualization libraries – Basic data visualization tools – Specialized Data Visualization tools.   [15 Hours]

Unit – III

Introduction to Python: Data types: Boolean – numbers – list – tuple – set – dictionaries. String: formatting strings – other common methods. Regular expressions. Closure and generators: List of functions – list of patterns – file of patterns – generators. Functions: Defining – calling – types. Input/Output: Printing on screen – reading a data from keyboard – opening and closing a file – reading and writing a file – file functions.   [10 Hours]

Unit – IV

Introduction to NumPy: Understanding data types in Python – The Basics of NumPy Arrays – Computation on NumPy Arrays: Universal Functions – Aggregations: Min, Max and Everything In Between – Computation on Arrays: Broadcasting – Comparisons, Masks and Boolean Logic – Fancy Indexing – Sorting Arrays – Structured Data: NumPy's Structured Arrays.   [10 Hours]

Unit –V

Data Manipulation with Pandas: Introducing Pandas Objects – Data Indexing and Selection – Operating on Data in Pandas – Handling Missing Data – Hierarchical Indexing – Combining Datasets: Concat and Append – Combining Datasets: Merge and Join – Aggregation and Grouping - Pivot Tables – Vectorized String Operations – Working with Time Series – High Performance Pandas: eval () and query (). Visualization with Matplotlib: Simple Line Plots – Simple Scatter Plots – Visualizing Errors – Density and Contour Plots – Histograms, Binning's and Density – Customizing Plots Legends. [15 Hours]

Recommended Textbooks:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Data Science Fundamentals and Practical approaches	Dr. Gypsy Nandi and Dr. Rupam Kumar Sharma	1st Edition, bpb publications	2020
2.	Dive into Python	Mark Pilgrim	CreateSpace	2009
3.	Python Data Science Handbook	Jake VanderPlas	O'reilly	2017

Reference Books:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Learning Python	Mark Lutz and David Ascher	O'Reilly	5th Edition 1999
2.	Data Science and Analytics (with python, R and SPSS programming)	V.K. Jain	1st Edition Kanna Publications	2019
3.	Python for Data Analysis	Wes McKinney	Shroff/O'Reilly; Second edition	2017

E-Learning Resources:

1	http:// www.w3schools.com
2	http:// www.tutorialspoint.com/python/
3	http:// onlinecourses.nptel.ac.in/noc21_cs33/preview

Course Outcomes:

CO No.	CO Statement
CO 1	Compare and contrast different data science fields.
CO 2	Discuss the differences between data and its processing, data visualization
CO 3	Create and execute python programs and ability to perform the data manipulation using python.
CO 4	Describe the NumPy and Pandas functionality and features used for data science
CO 5	Use the matplotlib library of Python for data visualization.

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	2	2	2	2	2
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
AVERAGE	2.8	2.8	2.8	2.8	2.8	2.8

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1,
No Correlated - 0

Teaching Methodology:

Lecture (Chalk and Talk), Problem Solving, E-Content, Peer Learning, Group Discussion, Quiz, Seminar.

Question Paper Pattern:

Knowledge Level	Section	Word Limit	Marks	Total	Time
K1	A – 10 x 2 Marks	50	20	100	3HRS
K1, K2	B – 5/7 x 8 Marks	250	40		
K2, K3	C – 2/4 x 20 Marks	500	40		

SEMESTER – IV

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/4C/COS	Core: Operating System	3	4	60	3	1	-	40	60	100

Course Objectives:

Enable the students to

1. Understand the fundamentals of Operating Systems.
2. Learn the mechanisms of OS to handle processes and threads and their communication.
3. Know the mechanisms involved in memory management
4. Gain knowledge on Mutual exclusion algorithms and deadlock algorithms.
5. Study the file system, directory and disk management

Course Outline:

Unit I

Introduction: Views- Goals - OS Structure - Components – Services. Process Concept – Process Scheduling – Operation on Processes – Cooperating Processes – Inter process Communication – Basic Concepts of CPU Scheduling – Scheduling Criteria – Scheduling Algorithms.   [10 Hours]

Unit II

Process Synchronization – The Critical Section Problem – Synchronization Hardware –Semaphores – Classic Problems of Synchronization – Deadlock Characterization – Methods for handling deadlocks- Deadlock Prevention – Deadlock Avoidance –Deadlock Detection – Recovery from deadlock. [15 Hours]

Unit III

Memory Management: Address Binding – Dynamic Loading and Linking – Overlays –Logical and Physical Address Space – Contiguous Allocation - Internal and External Fragmentation. Non – Contiguous Allocation: Paging and Segmentation Schemes – Implementation –Hardware –Protection – Sharing – Fragmentation.   [15 Hours]

Unit IV

Introduction to Virtual Memory – Demand Paging – Process Creation – Page Replacement – Allocation of Frames – Thrashing.   [10 Hours]

Unit V

File-System Structure – File-System Implementation – Directory Implementation –

Allocation Methods – Free-Space Management –Disk Structure – Disk Scheduling –Disk Management – Swap- space Management.   [10 Hours]

Recommended Text Books:

S. No	Title of the Book	Authors	Publishers	Year of Publication
1	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	John Wileyand Sons	2013

Reference Books:

S. No	Title of the Book	Authors	Publishers	Year of Publication
1.	Operating system	Stallings	Tata McGraw Hill	2018
2.	Operating system	Godbole Kahate	Tata Mc Graw Hill	2017

E - Learning Resources:

S. No.	URL
1	https://codescracker.com/operating-system/
2	https://www.tutorialspoint.com/operating_system/os_overview
3.	https://www.studytonight.com/operating-system/

Course Outcomes:

CO No.	CO Statement
CO 1	Analyze the structure of OS and basic architectural components involved in OS design
CO 2	Analyze the applications to run in parallel either using process or thread models
CO 3	Analyze the various device and resource management techniques for timesharing and distributed systems
CO 4	Understand the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
CO 5	Interpret the mechanisms adopted for file system, directory and disk

Mapping of Course Outcome with Programme Specific Outcome:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	1
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
AVERAGE	3	3	3	2.8	3	2.6

Teaching Methodology:

Lecture by chalk and talk, OHP, e- content, Problem Solving, Group Discussion, Quiz

Question Paper Pattern:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instruction if any
K1	A – 10 x 2 Marks	50	20		
K1, K3	B – 5/7 x 8 Marks	250	40	100	
K2, K3	C – 2/4 x 20 Marks	500	40		

SEMESTER – IV

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/4C/IML	Core: Introduction to Machine Learning	3	4	60	3	1	-	40	60	100

Course Objective:

Enable the students to
1. Provide an overview of Machine Learning.
2. Prepare and evaluate a model.
3. Provide feature engineering concepts
4. Introduce supervised learning concepts and algorithms
5. Introduce unsupervised learning concepts and algorithms

Course Outline:

Unit – I:
Introduction to Machine Learning: what is machine learning? – Types of machine learning – Applications of machine learning – Issues in machine learning. Preparing to Model: Machine Learning Activities-Types of Data – Data quality and remediation. [10 Hours]

Unit – II:
Modelling and Evaluation: Selecting a Model – Training a Model – Model representation and Interpretability - Model Performance and evaluation - Improving performance of a model. [10 Hours]

Unit – III:
Basics of Feature Engineering: Introduction – Feature Transformation – Feature subset selection. [10 Hours]

Unit – IV:
Supervised Learning (Classification): Introduction – Example – Classification model – Classification learning steps – Common classification algorithms. Supervised Learning (Regression): Introduction – Example – Common regression algorithms. [15 Hours]

Unit – V:
Unsupervised Learning: Introduction – Unsupervised Vs Supervised learning – Applications – Clustering – finding pattern using Association rule. [15Hours]

Recommended Textbooks:

S.No.	Title of the Book	Authors	Publishers	Year of Publications
1.	Machine Learning	Saikat Dutt, Subramanian Chandramouli, Amit Kumar Dass	Pearson India Education	2019

Reference Books:

S.No.	Title of the Book	Authors	Publishers	Year of Publication
1.	Machine Learning for Absolute Beginners: A Plain English Introduction	Oliver Theobald	Scatterplot Press	2017
2.	The Hundred-Page Machine Learning Book	Andriy Burkov	Genre: Computers	2019

E-Learning Resources:

S. No	URL
1	https://www.edureka.co/blog/machine-learning-tutorial/
2	https://www.toptal.com/machine-learning/machine-learning-theory-an-introductory-primer
3	https://www.coursera.org › learn › machine-learning
4	https://www.geeksforgeeks.org/machine-learning/

Course Outcomes:

CO No.	CO Statement
1	Demonstrate knowledge of the building blocks of Machine Learning
2	Implement the Machine learning algorithms
3	Represent models using different learning methods
4	Gain knowledge about the basic concepts of building Machine Learning models
5	Analyze and design a Machine Learning system

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	2	3	1	2	3	1
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	2.8	3	2.6	2.8	3	2.6

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Chalk and Talk, OHP, LCD. Seminar, Discussion, Quiz, Peer Learning

Question Paper Pattern:

Knowledge Level	Section/Mark	Word Limit	Marks	Total	Time	Special instructions if any
K1	A – 10 x 2	50	20			
K1, K3	B – 5/8 x 8	250	40	100	3 Hrs.	
K2, K3	C – 2/4 x 20	500	40			

SEMESTER IV

Course Code	Course Name	Credits	Hours / Week	Total Hours	L	T	P	CA	SE	Total
CA21/4A/CMA	Allied – Management Accounting	5	6	90	5	1	-	40	60	100

Course Objectives:

Enable the students to

1. Impart education about the principles and practices followed in the field of management accounting.
2. Familiarize with management tools such funds flow & cash flow statement, Ratio analysis, budgets and variance.
3. Develop skills of decision making in management accounts for efficient management.
4. Learn how to prepare the various types of budgets like production budget, sales budget, cash budget and flexible budget.
5. Perform cost variance analysis and prepare analyses of various special decision using relevant costing and benefits.

Course Outline:

Unit I:
Management accounting – Meaning, Scope, Importance and Limitations – Management accounting Vs Cost accounting – Management accounting vs. financial accounting.   [15 Hours]

Unit II:
Fund's flow and Cash flow statements as per AS3.   [20 Hours]

Unit III:
Ratio analysis – Advantages and Disadvantages - Classification of ratios: Profitability, Turnover, Coverage and Financial –DU PONT Control Chart (Theory).   [20 Hours]

Unit IV:
Budgets and budgetary control – Meaning – Advantages – Limitations – Installation of Budgetary control system – Classification of Budgets based in time, functions and Flexibility-Sales budget, Production budget, Cost of Production budget, Cash budget and Flexible budget.   (Simple problems only)
                    [20 Hours]

Unit V:
Standard costing and Variance analysis – meaning of Standard cost – significance of variance analysis – analysis of cost variances – material, labour variances.   [15 Hours]

Recommended Textbooks:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Management accounting	Dr. S. N. Maheswari	Sultan Chand & Sons	2018

Reference Books:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Advanced Accountancy, Volume II	Gupta R.L., M. Radha swamy	Sultan Chand & Sons	2018
2.	Management Accounting	N.M. Singhvi, Ruzbeh J. Bodhanwala	PHI Learning	2010

E-Learning Resources:

1	http:// www.wiziq.com/management-accounting
2	https:// www.dailymotion.com/video/x20ep75
3	http:// www.tutorialspoint.com / Accounting Basics/ Management A/c
4	https://www.tutorialspoint.com/accounting_basics/management_accounting_introductio.htm

Course Outcomes:

CO No.	CO Statement
CO 1	Critically analyze and provide recommendations to improve the operations of organizations through the management tools.
CO 2	Apply managerial accounting in such a way to demonstrate a clear understanding of ethical responsibilities.
CO 3	Develop and apply standards and budgets for planning and controlling purposes.
CO 4	Analyze various types of variances with their implication in standard costing.
CO 5	Apply incremental analysis to a range of business scenarios

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	2	2	2	1	3
CO 2	1	2	2	2	1	3
CO 3	1	2	2	2	1	3
CO 4	1	2	2	2	1	3
CO 5	1	2	2	2	1	3
AVERAGE	**1**	**2**	**2**	**2**	**1**	**3**

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1,
No Correlation - 0

Teaching Methodology:

Lecture (Chalk and Talk), Problem Solving, Group Discussion, Assignment, Quiz, Seminar.

Question Paper Pattern:

Knowledge Level	Section	Word Limit	Marks	Total	Time
K1	A – 10 x 2 Marks	50	20		
K1, K2	B – 5/7 x 8 Marks	250	40	100	3HRS
K2, K3	C – 2/4 x 20 Marks	500	40		

SEMESTER-IV

Course Code	Course Name	Credits	Hours / Week	Total Hours	L	T	P	CA	SE	Total
CA21/4C/PR5	Practical 5: Python and Data Science Laboratory	3	5	75	-	-	5	40	60	100

Course Objective:

Enable the students to
1. Implement the concept of Variables, Strings, Functions, Loops conditions.
2. Develop the skill of designing different Patterns in Python
3. Learn how to use NumPy for Numerical data.
4. Work with data in Python such as reading and writing files, loading, working and saving data with Pandas.
5. Learn how to use Matplotlib for Python Plotting

Course Outline:

1. Data Structure (Lists, Tuples, Dictionaries, Strings)
2. Regular Expressions
3. List of Functions
4. List of Patterns
5. File Concept
6. Error Handling
7. Implementation of NumPy Package
8. Implementation of Pandas Package
9. Implementation of Matplotlib Package

Course Outcome:

CO No.	CO Statement
CO 1	Able to write, test and debug Python code.
CO 2	Know the fundamentals of Python packages; including NumPy, Pandas and Matplotlib, then apply them to Data Analysis and Data Visualization projects.
CO 3	Use NumPy perform common data wrangling and computational tasks in Python.
CO 4	Use Pandas to create and manipulate data structures like Series and Data Frames.
CO 5	Students will be able to use python programming for solving data science problems.

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
AVERAGE	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Practical demonstrations, Discussion, Program writing.

Question Paper Pattern:

Knowledge Level	Section/Mark	Marks	Total	Time
K2, K3,K4,K5,K6	A – 2 X 30	60	60	3 Hours

SEMESTER IV

COURSE CODE	COURSE NAME	Credits	Hours / Week	Total Hours	L	T	P	CA	SE	TOTAL
CA21/4C/PO1	Project 1: Term Paper and Seminar	2	3	45	-	-	3	40	60	100

Course Objectives:

Enable the students to

1. create desire for continuous learning.
2. develop interpersonal and communication skills.
3. make the students to develop critical thinking and problem-solving skills.
4. get Knowledge in windows and MS-Office to draft the report
5. set the stage for future recruitment by potential employers.

Course Outline:

Any Computer related topic should be chosen as a term paper and it should be presented as a Seminar at the end of the semester.

Course Outcomes:

CO No.	CO Statement
CO 1	Identify, select and learn about a specific domain
CO 2	Analyze, design and implement algorithms
CO 3	Interpret results using Statistical measures

Mapping of Course Outcome with Programme Specific Outcome:

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
Average	**3**	**3**	**3**	**3**	**3**	**3**

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1,

No Correlation – 0

Question Paper Pattern:

Practical	Total
Presentation and Viva-Voce	60

COURSE PROFILE SEMESTER V

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/5C/DNT	Dot Net Technologies	4	5	75	3	2	-	40	60	100
CA21/5C/CSE	Software Engineering	4	5	75	3	2	-	40	60	100
CA21/5C/DMR	Data Mining using R	4	5	75	3	2	-	40	60	100
CA21/5E/AES	Elective I: Artificial Intelligence and Expert System	4	5	75	3	2	-	40	60	100
CA21/5E/OAD	Elective I: Object Oriented Analysis and Design	4	5	75	3	2	-	40	60	100
CA21/5C/PR6	Practical VI: Data Mining using R Laboratory	3	5	75	-	-	5	40	60	100
CA21/5C/PR7	Practical VII: Dot Net Laboratory	3	5	75	-	-	5	40	60	100

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/5C/DNT	Core: Dot Net Technologies	4	5	75	3	2	-	40	60	100

Course Objectives:

Enable the students to

1. Set up a programming environment for C#.NET.
2. Develop a data driven web application.
3. Set up a programming environment for ASP.NET programs.
4. Configure an ASP.NET application.
5. Creating ASP.NET applications using standard .net controls

Course Outline:

Unit - I

C# and the .NET architecture – C# basics – Objects and types – Inheritance – Generics: Overview – Creating Generic classes – Generic Features   [15 Hours]

Unit - II

Arrays and tuples – Operators and Casts – Strings and regular expressions – Collections – Errors and exceptions   [15 Hours]

Unit - III

ASP.NET Language Structure – HTML Server Controls – Basic Web Server Controls – Data List Web Server Controls – Other Web Server Controls.   [15 Hours]

Unit - IV

IE Web Controls – Tree View Control – Toolbar Control – Tab strip and Multipage Controls –Request and Response Objects – OLEDBConnection Class - OLEDBCommand Class - OLEDBTransaction Class – OLEDBDataAdapterClass – Dataset Class – Sample Applications   [15 Hours]

Unit – V

Advanced Issues – E-Mail – Application Issues – Working with IIS and Page Directives –Error Handling –Security   [15 Hours]

Recommended Text Books:

S. No	Title of the Book	Authors	Publishers	Year of Publicatio
1	Professional C# 4 and .NET 4	Christain Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner	Wiley	2010
2	ASP.NET Developer's Guide	Greg Buczek,	Tata McGraw Hill	2002

Reference Books:

S. No	Title of the Book	Authors	Publishers	Year of Publication
1	The Complete Reference C# 4.0	Herbert Schildt	McGraw Hill	2010
2.	The Complete Reference ASP.NET	Matthew MacDonald	McGraw-Hill/Osborne,	2002

E - Learning Resources:

S. No	URL
1	https://dotnettutorials.net/course/csharp-dot-net-tutorials/
2	www.w3schools.com/aspnet
3	www.tutorialspoint.com/asp.net
4.	www.asp.net-tutorials.com

Course Outcomes:

CO No.	CO Statement
CO 1	Describe the basic structure of a C#.NET project and use main features of IDE
CO 2	Debug and deploy C#.NET web applications
CO 3	Design web applications using ASP.NET
CO 4	Use ASP.NET controls in web applications.
CO 5	Create database driven ASP.NET web applications and web services

Mapping of Course Outcome with Programme Specific Outcome:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
AVERAGE	3	3	3	3	3	3

Teaching Methodology:

Lecture by chalk and talk, OHP, e- content, Problem Solving, Group Discussion.

Question Paper Pattern:

Knowledge Level	Section	Word Limit	Marks	Total	Special Instruction if any
K1	A – 10 x 2 Marks	50	20		
K1, K3	B – 5/7 x 8 Marks	250	40	100	
K2, K3	C – 2/4 x 20 Marks	500	40		

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/5C/CSE	Core: Software Engineering	4	5	75	3	2	-	40	60	100

Course Objective:

Enable the students to

1. Know about the software engineering along with software crisis and impart knowledge about the software development life cycle models used in the industry.

2. Inculcate the knowledge about the phases involved in the Requirement analysis and techniques practicing in the industry for size and cost estimation of the developing software.

3. Understand the design process and modularization for representation of the system and metrics for analyzing & evaluating the system.

4. Study and understand the different testing strategies applied at different stages of software development and highlighting the debugging tools available for automation.

5. Discuss the importance of the software maintenance phase along with the testing involved in the maintenance phase.

Course Outline:

Unit I:

Introduction: Software Crisis-What is software Engineering-Terminologies-Role of Management in Software Development. Software Life Cycle Models: SDLC Models-The Waterfall Model, Prototyping Model, Iterative Enhancement Model, Evolutionary Development Model, Spiral Model, The Rapid Application Development Model, Selection of a life cycle model, Agile view of Process   [15 Hours]

Unit II:

Software Requirements Analysis and Specifications: Requirement Engineering-Requirements Elicitation-Requirement Analysis-Requirements Documentation. Software Project Planning: Size Estimation-Cost Estimation-The constructive cost Model (COCOMO)-Software Risk Management.
[15 Hours]

Unit III:

Software Design: What is Design-Modularity-Strategy of Design-Function Oriented Design-Object Oriented Design. Software Metrics: Software Metrics: Software Metrics-Information flow Metrics-Metrics Analysis.   [15 Hours]

Unit IV:

Software Reliability: Basic Concepts-Capability Maturity Model. Software Testing-Testing Process-Terminologies-Functional Testing-Structural Testing-Levels of Testing-Debugging-Testing Tools.
                                                                                                      [15 Hours]

Unit V:

Software Maintenance: What is software Maintenance-The Maintenance Process-Maintenance Models-Regression Testing-Reverse Engineering-Software Reengineering-Documentation. [15 Hours]

Recommended Text Books:

S.No.	Title of the book	Authors	Publishers	Year of Publications
1.	Software Engineering	K.K Aggarwal and Yogesh Singh	New Age International Publishers	2008

Reference Books:

S.No.	Title of the book	Authors	Publishers	Year of Publications
1.	Software Engineering, A practioner's Approach.	Roger S.Pressman	McGrawHill international Edition.	6th Edition, 1982
2.	Software Engineering	Sommerville	Pearson Education.	7th Edition, 1982
3.	Software Engineering, An Engineering Approach	James F.Peters	John Wiely.	2007
4.	Software Engineering principles and practice.	Waman S Jawadekar	The McGraw Hill Companies	2000

E-Learning Resources:

1	https://www.javatpoint.com/software-engineering-tutorial
2	https://www.guru99.com/software-engineering-tutorial.html
3	https://www.geeksforgeeks.org/software-engineering/
4	https://www.coursera.org/courses?query=software%20engineering
5	https://www.edx.org/learn/software-engineering

Course Outcomes:

CO No.	CO Statement
1	Demonstrate the software engineering and its different software process models to develop the software
2	Gain knowledge about the phases of software requirement and methodologies for size and cost estimation.
3	Prepare the detailed blueprint design for implementation along with the evaluation metrices.
4	Apply the different testing techniques currently employed in industries to improve the quality of the software.
5	Understand the importance of maintenance phase and testing techniques to ensure the reliability of the software.

Mapping of Course Outcome with Programme Specific Outcome

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	3
CO 2	3	3	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	3	3	3	2	3	3
CO 5	3	3	3	2	3	3
Average	3	3	3	2	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Chalk and Talk, OHP, LCD. Seminar, Discussion, Quiz, Peer Learning, Assignment.

Question Paper Pattern:

Knowledge Level	Section/Mark	Word Limit	Marks	Total	Time	Special instructions if any
K1	A – 10 x 2	50	20			-
K1, K3	B – 5/8 x 8	250	40	100	3 Hrs.	
K2, K3	C – 2/4 x 20	500	40			

SEMESTER V

Course Code	Course Name	Credits	Hours / Week	Total Hours	L	T	P	CA	SE	TOTAL
CA21/5C/DMR	Core : Data Mining using R	4	5	75	3	2	-	40	60	100

Course Objectives:

Enable the students to

1. Know about knowledge discovery and to find interesting patterns in large data repositories.
2. Study various classification methods.
3. Describe basic concepts in clustering.
4. Understand and implement statistical concepts using R tool
5. Introduce the concept of visualization.

Course Outline:

Unit - I
Introduction - Data Mining applications – Data Mining techniques – Data Mining case studies- Data Mining software - Association rule mining - Introduction- basics- The task and a naive algorithm- Apriori algorithm – Improving the efficiency of the Apriori algorithm – FP-Growth   [15 Hours]

Unit – II
Classification - Introduction – Decision Tree – The Tree Induction Algorithm - Over fitting and pruning - DT rules - Estimating predictive accuracy - Other evaluation criteria – Classification software. [15 Hours]

Unit – III
Cluster analysis - Features – Types of data – Computing distances - Types of cluster analysis methods - partitioned methods – hierarchical methods – density-based methods – dealing with large databases – quality and validity – cluster analysis software.   [15 Hours]

Unit – IV
R Programming
Introduction - Features of R - Reserved words – Operators – Strings - Data types and operations - Basic Data types – Vectors – List – Matrices – Arrays – Factors - Data frames. Flow control- Decision making – Loops - Loop Control Statements   [15 Hours]

Unit – V
Functions & Packages
Function call - Built in functions – Packages - Charts and graphs: Bar charts – Histogram -Line graph - Pie charts - Box plots – Scatter plots - Strip charts. Connecting R to External Interfaces: CSV files - Microsoft Excel - Databases - XML files   [15 Hours]

Recommended Text Books:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Introduction to Data mining with case studies	G.K. Gupta	Third Edition, PHI Private Limited	2008
2.	Beginner's Guide for Data Analysis using R Programming	Jeeva Jose	Khanna Book Publishing co. Limited.,	2018

Reference Books:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Data mining	Kargupta	PHI Private limited	2004
2.	Data Mining Concepts and Techniques	Jiawei Han and Micheline Kamber	Third Edition, Elsevier	2000
3.	The Art of R programming - A tour of statistical software design	Norman Matloff	First Edition, No starch Press	2011

E-Learning Resources:

1.	https://www.tutorialspoint.com/data_mining/
2.	https://www.javatpoint.com/data-mining
3.	R Project: http://www.r-project.org/
4.	http://www.rstudio.com
5	https://nptel.ac.in/courses/106/105/106105174/
6	https://nptel.ac.in/courses/111/104/111104100/

Course Outcomes:

CO No.	CO Statement
CO 1	Create association rule in the transaction database
CO 2	Evaluate the performance of different classification algorithms
CO 3	Analyze various algorithms in clustering techniques
CO 4	Implement real time programs using R language
CO 5	Implement data mining methods in data inputs

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1,

No Correlation – 0

Teaching Methodology:

Lecture by chalk and talk, OHP, e-content, Group Discussion, Quiz, LCD, Seminar.

Question Paper Pattern:

Knowledge Level	Section	Word Limit	Marks	Total	Time
K1	A – 10 x 2 Marks	50	20		
K1, K3	B – 5/7 x 8 Marks	250	40	100	3 Hrs
K2, K3	C – 2/4 x 20 Marks	500	40		

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/5E/AES	Elective I: Artificial Intelligence and Expert System	4	5	75	3	2	-	40	60	100

Course Objective:

Enable the students to
1. Know about Artificial Intelligence problems and techniques to solve it.
2. Use various Artificial Intelligence searching algorithms.
3. Understand the fundamentals of knowledge representation.
4. Provide an overview of Expert system.
5. Prepare and build an expert system.

Course Outline:

Unit – I:
Artificial Intelligence: AI Problems – AI Techniques – Tic Tac Toe. Problems, Problem spaces, and search: Defining the problem of space search – state space search – Production Systems – Problem Characteristics – Production System Characteristics   [15 Hours]

Unit – II:
Heuristic search techniques – Generate and test – Hill Climbing – Best First Search- OR Graphs – A* Algorithms – Problem Reduction – Constraint Satisfaction – Means Ends Analysis. Knowledge Representation issues: Representations and Mappings – Approaches   [15 Hours]

Unit – III:
Using Predicate Logic: Representing in simple facts in logic – Representing instance and Isa Relationship – Computable functions and predicates – Resolution. Representing Knowledge using Rules: Procedural Vs Declarative Knowledge – Logic Programming – Forward Vs Backward Reasoning. [15 Hours]

Unit – IV:
Expert Systems – Good in Expert Systems – Organizing Expert Systems – Difference between Expert Systems and Conventional Programs.   [15 Hours]

Unit – V:
Expert System Tools: Knowledge representation in Expert Systems — stages in the development of Expert System tools – Example: EMYCIN - Building an Expert System - Choosing a tool for building Expert System - Acquiring knowledge from the Experts   [15 Hours]

Recommended Textbooks:

S.No.	Title of the Book	Authors	Publishers	Year of Publications
1.	Artificial Intelligence	Elaine Rich	Third Edition, McGraw-Hill	1983
2.	A Guide to Expert Systems	Donald A. Waterman	Pearson Education	1986

Reference Books:

S.No.	Title of the Book	Authors	Publishers	Year of Publications
1.	Foundation of Artificial Intelligence and Expert Systems	Janakiraman	Third Edition, Macmillan	2005

E-Learning Resources:

S.No	URL
1	https://www.javatpoint.com/artificial-intelligence-tutorial
2	https://www.tutorialspoint.com/artificial_intelligence/index.htm
3	https://www.guru99.com/expert-systems-with-applications.html
4	https://nptel.ac.in/courses/106/105/106105077/
5	https://nptel.ac.in/courses/106/106/106106126/

Course Outcomes:

CO No.	CO Statement
1	Demonstrate knowledge of the building blocks of Artificial Intelligence
2	Develop intelligent algorithm for constraint satisfaction problems
3	Represent knowledge using predicate logic
4	Gain knowledge about the basic concepts of building Expert system
5	Analyze and design an Expert system

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	**2.8**	**3**	**3**	**3**	**3**	**3**

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Chalk and Talk, OHP, LCD. Seminar, Discussion, Quiz, Peer Learning.

Question Paper Pattern:

Knowledge Level	Section/Mark	Word Limit	Marks	Total	Time	Special instructions if any
K1	A – 10 x 2	50	20			
K1, K3	B – 5/8 x 8	250	40	100	3 Hrs.	
K2, K3	C – 2/4 x 20	500	40			

Course Code	Course Name	Credits	Hours/Week	Total Hours	L	T	P	CA	SE	Total
CA21/5E/OAD	Elective I: Object Oriented Analysis and Design (MOOC)	4	5	75	3	2	-	40	60	100

Course Objective:

Enable the students to
1. Explain about the challenges in software engineering.
2. Recognize the concepts and principles of object model.
3. Master the main concepts of object technologies and how to apply them at work and develop the ability to analyze and solve challenging problem in various domains.
4. Describe how to employ the UML notation to create effective and efficient system designs
5. Perform overall design using various UML diagrams

Course Outline:

Unit I:
Challenges in Software Engineering - Complexity of Software - Structure and Attributes of a Complex System - Object-Oriented Analysis and Design - Bringing Order to Chaos [15 Hours]

Unit II:
Evolution of Object Models - Programming Languages and Paradigms - Foundations of the Object Model - OOA, OOD and OOP - Elements of Object Model (Major): Abstraction and Encapsulation - Modularity and Hierarchy - Elements of the Object Model (Minor): Typing, Concurrency and Persistence
[15 Hours]

Unit – III:
Nature of an object: State, Behavior and Identity - Relationships among objects - Nature of a class: Interface and Implementation - Relationships among classes - Build Quality Classes and Objects.
[15 Hours]

Unit – IV:
Identification of Classes, Objects and Relationship in LMS - Overview of UML - SDLC Phases and UML Diagrams. [15 Hours]

Unit – V:
Use-Case Diagrams - Class Diagrams - Sequence Diagrams – Communication Diagram – Activity diagrams – Interaction Overview Diagram – State Machine Diagram. [15 Hours]

Recommended E-Learning Course:

S.No.	URL
1	https://nptel.ac.in/courses/106/105/106105153/

E-Learning Resources:

S.No.	URL
1	https://www.tutorialspoint.com/object_oriented_analysis_design/index.htm
2.	https://www.studocu.com/in/document/anna-university/ooad/other/ooad-tutorial-this-book-contain-all-the-concepts-of-ooad-and-its-an-local-author-from-seekersweb/5199394/view
3.	https://www.startertutorials.com/uml/category/ooad

Course Outcome:

CO No.	CO Statement
1	Understand the object-oriented approach for analyzing and designing systems and software solutions
2	Illustrate the importance of modelling in the software development life cycle
3	Analyze the problem by applying and develop software solutions.
4	Become familiar with the Unified Modelling Language.
5	Demonstrate various diagrams for modeling.

Mapping of Course Outcome with Programme Specific Outcome:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Average	**3**	**3**	**3**	**3**	**3**	**3**

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

MOOCs Course Online videos, Group Discussion

Question Paper Pattern:

Knowledge Level	Section/Mark	Word limit	Marks	Total	Time	Special instructions if any
K1	A - 10 X 2	50	20			
K1, K3	B - 5/7 X 8	250	40	100	3 Hrs.	-
K2, K3	C - 2/4 X 20	500	40			

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/5C/PR6	Practical 6: Data Mining using R Laboratory	3	5	75	-	-	5	40	60	100

Course Objectives:

Enable the students to

1. Understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O.
2. Understand the importance of Matrices and Functions.
3. Discuss the methods to read data from CSV and Excel Files.
4. Understand importance of Visualization methods.
5. Learn to implement data mining techniques.

Course Outline:

1. Program using Mathematical functions.
2. Program for Matrix Operations.
3. Program using Functions.
4. Program for Reading data from CSV files
5. Program for Reading data from Excel files.
6. Program for implementing descriptive statistics (Mean, Median, SD, Variance)
7. Program for Working with Graphics (Scatterplots, Histogram, Barplots)
8. Program for implementing association rule mining.
9. Program for implementing classification.
10. Program for implementing clustering.

Course Outcomes:

CO No.	CO Statement
1	Able to Apply the concept of R Programming constructs
2	Able to Apply the basic concepts of R such as operators, mathematical functions, Matrices, and Functions
3	Able to Apply the concept of reading CSV and Excel files
4	Able to design the application for ARM, Classification
5	Able to design the concept of Cluster Analysis

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Practical demonstrations, Discussions, Program writing.

Question paper Pattern:

Knowledge Level	Section/Mark	Marks	Total	Time
K2, K3, K4, K5, K6	A - 2 X 30	30	60	3 Hours

Course Code	Course Name	Credits	Hours/ Week	Total hrs.	L	T	P	CA	SE	Total
CA21/5C/PR7	Practical 7: Dot Net Laboratory	3	5	75	-	-	5	40	60	100

Course Objectives:

Enable the students to

1. Introduce .Net IDE Component Framework.
2. Creating VB.net and ASP.net applications using standard .net controls.
3. Programming Concepts and MDI Applications in .Net Framework.
4. Inculcate knowledge about basic and data list web server controls.
5. Develop data driven applications.

Course Outline:

Visual Basic .NET

1. Menus and Toolbars.

2. Working with Arrays

3. Working with User Input Controls

   a. Buttons

   b. Text Boxes

   c. Check Boxes

   d. Radio Buttons

   e. Combo Boxes

4. Working with MDI Applications

5. Drag and Drop operations.

6. VB .Net with database access.

ASP.NET

1. Working with basic web server controls

2. Working with data list web server controls.

3. Calendar and Ad Rotator Controls

4. Validation Controls.

5. Working with Database Connectivity

Course Outcomes:

CO No.	CO Statement
1	Use the IDE Framework of .Net.
2	Students will be able to design applications using standard .netcontrols.
3	Create user interactive web pages using .Net.
4	Create simple data binding applications using ADO.Netconnectivity.
5	Students will be able to create database driven .Net webapplications and web services.

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	3	3	3	3	3	3

Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0

Teaching Methodology:

Practical demonstrations, Discussions, Program writing.

Question paper Pattern:

Knowledge Level	Section/Mark	Marks	Total	Time
K2, K3, K4, K5, K6	A - 2 X 30	30	60	3 Hours

COURSE PROFILE SEMESTER VI

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/6C/DCN	Data Communications and networking	4	5	75	3	2	-	40	60	100
CA21/6C/ANP	Android Programming	4	5	75	3	2	-	40	60	100
CA21/6C/BDA	Big Data Analytics	4	5	75	3	2	-	40	60	100
CA21/6E/IOT	Elective II: Internet of Things	4	5	75	3	2	-	40	60	100
CA21/6E/CCT	Elective II: Cloud Computing	4	5	75	3	2	-	40	60	100
CA21/6C/PR8	Android Programming Lab	3	5	75	-	-	5	40	60	100
CA21/6C/PO2	Mini Project	4	5	75	-	-	5	40	60	100

SEMESTER VI

BRIDGE COURSE TITLE	HOURS
Introduction to System Analysis and Design	8

Course Objective:

Enable the students to
1. Develop new system based on requirements
2. Get Knowledge to collect data
3. Able to draw ER diagram, DFD, Menu Flow diagram

Course Outline:

System Definition – Requirement Analysis – Data Collection – Front end and back end development – ER diagram – Data dictionary – Data flow diagram – Menu flow diagram – System testing – Levels of testing

Course Code	Course Name	Credits	Hours / Week	Total Hours	L	T	P	CA	SE	TOTAL
CA21/6C/DCN	Core: Data Communications and Networking	4	5	75	3	2	-	40	60	100

Course Objectives:

Enable the students to

1. Inculcate the knowledge on basic networking concepts and OSI Model.

2. Understand the concepts of various error detection and correction methods.

3. Introduce multiplexing and switching concepts.

4. Make the students aware of technologies like ATM and ISDN.

5. Introduce internetworking devices.

Course Outline:

Unit – I

Introduction to Data Communication, Network Protocols & standards - Line Configuration - Topology - Transmission mode - Classification of Network. OSI Model: Layers of OS1 Model.   [15 Hours]

Unit - II

Digital data transmission - DTE/DCE interface – Modems. Transmission media: Guided Media - Unguided Media – Transmission impairment – Performance. Error Detection and Error Correction: types of errors – detection – VRC – LRC – CRC – checksum – error correction.   [15 Hours]

Unit - III

Multiplexing: FDM – WDM – TDM. LAN: Ethernet - Token Bus - Token Ring – FDDI. SWITCHING: Circuit Switching - Packet Switching - Message switching.   [15 Hours]

Unit - IV

ISDN: History – Subscriber Access to ISDN - ISDN Layers - Broadband ISDN. ATM: Design goals - ATM Architecture – Switching - ATM layers.   [15 Hours]

Unit - V

Networking and internetworking devices: Repeaters - Bridges - Routers - Gateway - Routing algorithms. TCP/IP: overview – Network layer – addressing – sub netting – other protocols in the network layer – transport layer – Domain name system – TELNET- FTP – TFTP – SMTP - SNMP – HTTP - World Wide Web.   [15 Hours]

Recommended Text Books:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Introduction to Data Communication and Networking	Behrouz and Forouzan	4nd Edition, TMH	2017

Reference Books:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Communication Networks (A first Course)	Jean Wairand	Second Edition, WCB/McGraw Hill	1998

E-Learning Resources:

1	https:// www.networktutorials.info
2	https://www.coursera.org/browse/information-technology/networking
3	https://www.webopedia.com
4	https://www.tutorialspoint.com/data_communication_computer_network/index.html

Course Outcomes:

CO No.	CO Statement
CO 1	Compare and contrast LAN and WAN in terms of Characteristics and functionalities
CO 2	Discuss the differences between cyclic redundancy check and checksum in terms of performance and implementation
CO 3	Discuss the features and functions of multiplexing and switching
CO 4	Explain the role of ATM and ISDN Layers in architecture
CO 5	Identify various types of internetworking devices and their features

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	2	2	3	2	3	1
CO 2	1	3	3	2	3	3
CO 3	3	3	3	1	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	**2.4**	**2.8**	**3**	**2.2**	**3**	**2.6**

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1,

No Correlation – 0

Teaching Methodology:

Lecture by chalk and talk, OHP, e-content, Group Discussion, Quiz, LCD, Seminar.

Question Paper Pattern:

Knowledge Level	Section	Word Limit	Marks	Total	Time
K1	A – 10 x 2 Marks	50	20	100	3 Hours
K1, K3	B – 5/7 x 8 Marks	250	40		
K2, K3	C – 2/4 x 20 Marks	500	40		

Course Code	Course Name	Cre dits	Hours/ Week	Total Hour s	L	T	P	CA	SE	Total
CA21/6C/ANP	Core: Android Programming	4	5	75	3	2	-	40	60	100

Course Objective:

Enable the students to

1. Enable the students to understand the basic android development tools and the clear vision about Android manifest files and user interface.
2. Inculcate the knowledge about the various layouts and utilize the resources in Android Application.
3. Know more about how to add multimedia content in the Android Application and the existing widgets to better Application.
4. Enable the students to display and use the different kind of dialogs available for multiple purpose.
5. Discuss the more interactive controls available to create better User Interface and how to connect the Application with SQLite database.

Course Outline:

Unit I:

Introduction to Android – Creating the First Android Project - Using the Text View Control - Using the Android Emulator - Limitations of the Android Emulator Basic Widgets - Understanding the Role of Android Application Components - Understanding Activities - Role of the Android Manifest File - Creating the User Interface - Commonly Used Layouts and Controls- Displaying Messages Through Toast -Creating and Starting an Activity - Using the Edit Text Control .- Choosing Options with Checkbox Choosing Mutually Exclusive Items Using Radio Buttons   [15 Hours]

Unit II:

Building Blocks for Android Application Design -Laying Out Controls in Containers - Introduction to Layouts - Linear Layout - Relative Layout - Absolute Layout - Frame Layout - Table Layout - Operations Applicable to Table Layout Grid Layout - Specifying Row and Column Position - Adapting to Screen Orientation - Anchoring Controls Defining Layout Utilizing Resources and Media Resources - Creating Values Resources- Using Drawable Resources – Switching States with Toggle Buttons   [15 Hours]

Unit III:

   Creating an Image Switcher Application - Scrolling Through Scroll View - playing audio – playing video - Using Selection Widgets - Using List View - Using the Spinner Control - Using the Grid View Control - Creating an Image Gallery Using the View Pager Control   [15 Hours]

Unit IV:

   Displaying and Fetching Information Using Dialogs and Fragments – What are dialogs - Selecting the Date and Time in One Application – Fragments - Creating Fragments with Java Code -Creating Special Fragments   [15 Hours]

Unit V:

   Creating Interactive Menus and Action Bars - Menus and Their Types - Creating Menus Through XML - Creating Menus Through Coding - Applying a Context Menu to a List View - Using the Action Bar - Replacing a Menu with the Action Bar - Creating a Tabbed Action Bar - Creating a Drop-Down List Action Bar - Using Databases - Using the SQLiteOpenHelper Class - Accessing Databases with the ADB - Creating a Data Entry Form   [15 Hours]

Recommended Text Books:

S.No.	Title of the book	Authors	Publishers	Year of Publications
1.	Android Programming Unleashed	B.M. Harwani	Pearson Education	2013

Reference Books:

S.No.	Title of the book	Authors	Publishers	Year of Publications
1.	Android Apps for Absolute Beginners	Wallace Jackson	Apress	2013
2.	Android Application Development - All-in-One For Dummies	Barry A. Burd	Wiley	2011
3.	Head First Android Development	Dawn Griffiths & David Griffiths	OReilly	2015

E-Learning Resources:

1	https://developer.android.com/training/basics/firstapp
2	https://www.javatpoint.com/android-tutorial
3	https://o7planning.org/11007/android
4	https://www.studytonight.com/android/
5	https://www.udemy.com/topic/android-development/
6	https://www.coursera.org/courses?query=android%20programming

Course Outcomes:

CO No.	CO Statement
1	Able to design the simple Android Applications
2	Gain Knowledge about the various layouts and resources available for multiple purposes.
3	Able to design the Android Application with the multimedia content and existing widgets for ready to use.
4	Identify and utilize the different dialogs required as per the need of Android Application
5	Develop the Application with the better User Interface and also dynamically connect with the SQLite database.

Mapping of Course Outcome with Programme Specific Outcome

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

<u>Teaching Methodology:</u>

Chalk and Talk, OHP, LCD. Seminar, Discussion, Quiz, Peer Learning, Assignment.

<u>Question Paper Pattern:</u>

Knowledge Level	Section/Mark	Word Limit	Marks	Total	Time	Special instructions if any
K1	A – 10 x 2	50	20			-
K1, K3	B – 5/8 x 8	250	40	100	3 Hours	
K2, K3	C – 2/4 x 20	500	40			

SEMESTER VI

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/6C/BDA	Core: Big Data Analytics	4	5	75	3	2	-	40	60	100

Course Objectives:

Enable the students to

1. study the basic technologies that forms the foundations of Big Data.
2. understand the specialized aspects of big data including big data application, and big data analytics.
3. understand the predictive analytics and descriptive analytics.
4. demonstrate the use of survival analysis techniques.
5. impart in depth knowledge on Social Network analytics.

Course Outline:

Unit-I:

Basic nomenclature - Analytics process model - Analytics model requirements - Types of data sources – Sampling - types of data elements - Visual Data Exploration and Exploratory Statistical Analysis - Missing Values - Outlier Detection and Treatment - Standardizing Data – Categorization - weights of evidence coding - Variable selection – Segmentation   [15 Hours]

Unit-II:

Predictive Analytics: Target Definition - Linear Regression - Logistic Regression - Decision Trees - Neural Networks - Support Vector machines - Ensemble Methods - Multiclass Classification Techniques - Evaluating Predictive Models.   [15 Hours]

Unit-III:

Descriptive Analytics: Association Rules - Sequence Rules - Segmentation.   [15 Hours]

Unit-IV:

Survival Analysis: Survival Analysis Measurements – Kaplan Meier Analysis – Parametric Survival analysis – Proportional hazards regression – Extensions of Survival analysis model – Evaluating Survival analysis model.   [15 Hours]

Unit-V:

Hadoop – Hadoop distributed file system – Interacting with HDFS – Interacting with HDFS from Python applications. [15 Hours]

Recommended Textbooks:

S.No.	Title of the Book	Authors	Publishers	Year of Publication
1.	Analytics in a Big Data World: The Essential Guide to Data Science and Its applications	Bart Baesens	Wiley India Private Limited	2014
2	Data Science Fundamentals and Practical Approaches: Understand Why Data Science Is the Next	Dr.Gypsy Nandi, Dr.Rupam Kumar Sharma	BPB Publications	2020

Reference Books:

S.No.	Title of the Book	Authors	Publishers	Year of Publication
1.	Big Data and Analytics	Seema Acharya, Subhashini Chellappan	Wiley Publication	2015
2.	Big Data for Dummies	Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman	John Wiley & Sons, Inc.,	2013

E-Learning Resources:

1	https://www.coursera.org/specializations/big-data
2	https://nptel.ac.in/courses/106/104/106104189/
3	https://www.edx.org/course/big-data-analytics-2
4	https://www.tutorialspoint.com/big_data_tutorials.htm

Course Outcomes:

CO No.	CO Statement
1	Understand the building blocks of Big Data
2	Implement the specialized aspects of big data with the help of different big data applications
3	Represent the analytical aspects of Big Data.
4	Identify right machine learning / mining algorithm for handling massive data.
5	Able to analyze and work upon voluminous data of any organization from various perspectives and will be able to develop reports and trends

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Lecture by Chalk and Talk, OHP, LCD, Seminar, Discussion, Peer Learning.

Question paper Pattern:

Knowledge Level	Section/Mark	Word limit	Marks	Total	Time	Special instructions if any
K1	A - 10 X 2	50	20			-
K1, K3	B - 5/7 X 8	250	40	100	3 Hrs.	
K2, K3	C - 2/4 X 20	500	40			

SEMESTER VI

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/6E/IOT	Elective II: Internet of Things	4	5	75	3	2	-	40	60	100

Course Objective:

Enable the students to

1. Know about the basic concepts and characteristics of IOT with logical and physical design of IOT.
2. Inculcate the knowledge about the application of IOT on various domains and understand the difference between M2M and IOT.
3. Understand the design methodology and basic building blocks of IOT.
4. Enable the students to gain the knowledge about cloud services for IOT.
5. Discuss the techniques for analyzing the data collected from IOT.

Course Outline:

Unit I:

Introduction to Internet of Things: Introduction – Definition and Characteristics of IOT – Physical Design of IOT – Logical Design of IOT – Enabling Technologies – IOT Levels and Deployment Templates.

[15 Hours]

Unit II:

Domain Specific IOTs: Home – Environment – Retail – Logistics – Agriculture. IOT and M2M: M2M – Difference between IOT and M2M – SDN and NFT for IOT   [15 Hours]

Unit III:

IOT Platforms Design Methodology: IOT Design Methodology – Motivation for using Python. Basic Building Blocks of IOT Device: Exemplary Device: Raspberry pi – other IOT Device   [15 Hours]

Unit IV:

IOT Physical Services & Cloud Offering: Introduction to Cloud Storage models & Communication API's – WAMP Autobahn for IOT – Amazon web services for IOT.   [15 Hours]

Unit V:

Data Analytics for IOT: Introduction – Apache Hadoop – Using Hadoop MapReduce for Batch Data Analysis – Apache Storm – Using Apache Storm for Real-time Data Analysis. [15 Hours]

Recommended Text Books:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Internet of Things	Arshdeep Bahga & Vijay Madisetti	Universities Press	2015

Reference Books:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	Designing the Internet of Things	Adrian McEwen, Hakkim Cassimally	Wiley	2013
2.	Building the Internet of Things	Maciej Kranz	Wiley	2016
3.	The Internet of Things	Michael Miller	Que	2015

E-Learning Resources:

1	https://www.tutorialspoint.com/internet_of_things
2	https://www.javatpoint.com/iot-internet-of-things
3	https://www.guru99.com/iot-tutorial
4	https://mindmajix.com/iot-tutorial
5	https://online.stanford.edu/courses/xee100-introduction-internet-things
6	https://www.udemy.com/topic/internet-of-things/

Course Outcomes:

CO No.	CO Statement
1	Understand the basics, logic and physical design of IOT.
2	Gain knowledge about the various domain applications of IOT
3	Able to design the IOT products and gain knowledge about basic building of IOT.
4	Identify the suitable cloud platform for developing IOT products.
5	Learn the various frameworks for Real-time data analysis collected from the IOT Product.

Mapping of Course Outcome with Programme Specific Outcome

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Chalk and Talk, OHP, LCD. Seminar, Discussion, Quiz, Peer Learning, Assignment.

Question Paper Pattern:

Knowledge Level	Section/Mark	Word Limit	Marks	Total	Time	Special instructions if any
K1	A – 10 x 2	50	20			-
K1, K3	B – 5/8 x 8	250	40	100	3 Hrs.	
K2, K3	C – 2/4 x 20	500	40			

Course Code	Course Name	Credits	Hours / Week	Total Hours	L	T	P	CA	SE	Total
CA21/6E/CCT	Elective II: Cloud Computing (MOOC)	4	5	75	3	2	-	40	60	100

Course Objectives:

Enable the students to

1. Study the importance of cloud computing in the E-Commerce world.
2. Examine the advantages and dis-advantages of the cloud computing in E-Commerce business.
3. Study the legal issues involved in cloud computing.
4. Study the different features and characteristics in E-Commerce.
5. Analyze the improved efficiency of cloud computing in this modern world.

Course Outline:

Unit - I

Introduction to Cloud Computing: Overview of Computing – NIST Model – Properties, Characteristics and disadvantages – Role of Open Standards.   [15 Hours]

Unit - II

Cloud Computing Architecture: Cloud Computing stack – Services Models (Xaas): Infrastructure as a Service (Iaas) – Platform as a Service (PaaS) – Software as a Service (SaaS) – Deployment Models   [15 Hours]

Unit - III

Service Management in Cloud Computing: Service Level Agreements (SLAs)- Cloud Economics- Resource Management in Cloud Computing.   [15 Hours]

Unit - IV

Data Management in Cloud Computing: Data, Scalability and Cloud Services – Database and Data stores in Cloud – Large Scale Data Processing.   [15 Hours]

Unit – V

Cloud Security: Infrastructure Security – Data Security and Storage – Identity and Access Management – Access Control, Trust, Reputation and Risk.   [15 Hours]

Recommended E-Learning Resource:

https://nptel.ac.in/courses/106/105/106105167/#

Books and References:

S. No	Title of the Book	Authors	Publishers	Year of Publication
1	Cloud Computing: Principles and Paradigms	Raj Kumar Buyya, James Broberg, Andrzej M. Goscinski	Wiley	2011
2	Enterprise Cloud Computing - Technology, Architecture, Applications	Gautam Shroff,	Cambridge University Press, 2010	2010
3	Cloud Computing Bible	Barrie Sosinsky	Wiley India	2010
4	Cloud Security: A Comprehensive Guide to Secure Cloud Computing	Ronald L. Krutz, Russell Dean Vines	Wiley India	2010

Reference E - Learning Resources:

	URL
1	https://www.javatpoint.com/cloud-computing-tutorial
2	https://www.edx.org/micromasters/cloud-computing
3	https://www.coursera.org/specializations/cloud-computing
4	https://aws.amazon.com/training/awsacademy/cloud-computing-architecture/

Course Outcomes:

CO No.	CO Statement
CO 1	Apply the core concepts of the cloud computing paradigm.
CO 2	Illustrate the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO 3	Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
CO 4	Identify problems, and explain, analyze, and evaluate various cloud computing solutions.
CO 5	Analyze various cloud programming models and apply them to solve problems on the cloud.

Mapping of Course Outcome with Programme Specific Outcome:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
AVERAGE	3	3	3	3	3	3

Teaching Methodology:

MOOC Online Videos, Group Discussion.

Question Paper Pattern:

Knowledge Level	Section/Mark	Word limit	Marks	Total	Time	Special instructions if any
K1	A - 10 X 2	50	20			-
K1, K3	B - 5/7 X 8	250	40	100	3 Hrs.	
K2, K3	C - 2/4 X 20	500	40			

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/6C/PR8	Practical 8: Android Programming Lab	3	5	75	-	-	5	40	60	100

Course Objectives:

Enable the Students to

1. Understand the components and structure of mobile application development framework for Android and windows OS-based mobiles.
2. Learn about how to work with various mobile application development frameworks.
3. Know the basic and important design concepts & issues of development of mobile applications.
4. Inculcate the knowledge about the capabilities and limitations of mobile devices.
5. Gain the knowledge about connecting SQLite database with Android mobile applications.

Course Outline:

1. Develop an application that uses GUI Components Font and Colors.
2. Develop and application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that make use of database.
6. Develop a native application that uses GPS location information.
7. Implement an application that creates an alert upon receiving a message.
8. Write a mobile application that creates alarm clock.
9. Implement an application that writes data to the SD card.
10. Develop an application that uses multimedia content

Course Outcomes:

CO No.	CO Statement
1	Able to design the Application with different GUI Components.
2	Able to understand and implement the concept of GPS Tracking
3	Able to connect the mobile application with virtual database.
4	Able to write the data into SD card using mobile application.
5	Able to develop the mobile application that uses multimedia content.

Mapping of Course Outcome with Programme Specific Outcome:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
Average	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Practical demonstrations, Discussions, Program writing.

Question paper Pattern:

Knowledge Level	Section/Mark	Marks	Total	Time
K2,K3,K4,K5,K6	A - 2 X 30	30	60	3 Hours

SEMESTER VI

Course Code	Course Name	Credits	Hours/ Week	Total Hours	L	T	P	CA	SE	Total
CA21/6C/PO2	Project 2: Mini Project	4	5	75	-	-	5	40	60	100

Course Objectives:

Enable the students to

1. give exposure about software industry.
2. develop interpersonal and communication skills.
3. make the students to develop critical thinking and problem-solving skills.
4. get knowledge about document preparation.
5. develop software projects.

Course Outline:

Project: Any Computer related software has to be developed and presented for viva-voce at the end of the semester.

Course Outcomes:

CO No.	CO Statement
CO 1	Identify, select and learn about a specific domain
CO 2	Analyze, design and implement algorithms
CO 3	Interpret results using Statistical measures

Mapping of Course Outcome with Programme Specific Outcome:

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
Average	**3**	**3**	**3**	**3**	**3**	**3**

Key: Strongly Correlated – 3, Moderately Correlated – 2, Weakly Correlated – 1, No Correlation – 0

Viva –Voce:

Knowledge Level	Marks	Total
K2, K3, K4, K5, K6	60 (for Mini Project)	60

SEMESTER III

Course Code	Course Name	Credits	Hours/Week	Total Hours	L	T	P	CA	SE	Total
CA21/3N/WWH	Non - Major Elective: World Wide Web Design with HTML	2	2	30	-	-	2	-	50	50

Course Objective:

Enable the students to

1. Outline the basic internet concepts.
2. Build web pages using HTML commands.
3. Build a web page using Style sheets, Frames and Forms.

Course Outline:

Unit I:

Introduction to the Internet – Internet browsers - Introduction to HTML – Head and body sections
[10 Hours]

Unit II:

Designing the body section - Ordered and Unordered lists – Table handling   [10 Hours]

Unit III:

DHTML and style sheets - Frames – Forms   [10 Hours]

Recommended Text Books:

S.No.	Title of the book	Authors	Publishers	Year of Publication
1.	World Wide Web Design with HTML	C. Xavier	Tata McGraw Hill	2017
2.	A complete guide to internet and web programming	Deven N.Shah	Wiley	2009

E-Learning Resources:

1	www.w3schools.com
2	www.tutorialspoint.com/html/index.html
3	www.simplehtmlguide.com

Course Outcomes:

CO No.	CO Statement
1	Describe the basic concepts of Internet programming and protocols used.
2	Create Web applications using HTML commands.
3	Develop Web applications using HTML Frames and Forms.

Mapping of Course Outcome with Programme Specific Outcome:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
Average	3	3	3	3	3	3

Key: Strongly Correlated – 3, Moderately Correlated – 2 , Weakly Correlated – 1, No Correlation – 0.

Teaching Methodology:

Practical demonstrations, Discussion, Program writing.

Question Paper Pattern:

Knowledge Level	Section/Mark	Marks	Total	Time
K2,K3,K4,K5,K6	A - 1 X 50	50	50	90 Minutes

Course Code	Course Name	Credits	Hours /Week	Total Hours	L	T	P	CA	SE	Total
CA21/4N/DAE	Non-Major Elective: Data Analytics Using Excel	2	2	30	-	-	2	-	50	50

Course Objectives:

Enable the students to

1. teach the basics of Excel table creation and its reports.
2. inculcate knowledge about pivot table and pivot chart.
3. understand the basics of dashboard and analyze data

Course Outline:

Unit – I

Create Excel table – Filtering Excel Data – Formatting Excel Data – Create Excel Charts – Sort, filter and validate data – Summarize data – Format summarized data.   [10 Hours]

Unit – II

Creating a Pivot table – Creating a Pivot Chart – Editing Pivot tables and Pivot charts.   [10 Hours]

Unit-III

Create a Dashboard: Dashboard – Filter data using a slicer – Add calculated columns to a dashboard – Find anomalies.   [10 Hours]

Recommended Text Books:

S. No	Title of the Book	Authors	Publishers	Year of Publication
1	Excel Data Analysis for Dummies	Paul McFedris	Wiley	2019

E - Learning Resources:

S. No	URL
1	https://www.excel-easy.com/data-analysis.html
2	https://docs.microsoft.com/en-us/learn/certifications/courses/10994

Course Outcomes:

CO No.	CO Statement
CO 1	Create an Excel report and Excel table.
CO 2	Create a pivot table and pivot chart.
CO 3	Create a dashboard and analyze data

Mapping of Course Outcome with Programme Specific Outcome:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
AVERAGE	3	3	3	3	3	3

Teaching Methodology:

Practical Demonstrations, Discussion, Program writing.

Question Paper Pattern:

Knowledge Level	Section/Mark	Marks	Total	Time
K2, K3, K4, K5, K6	A – 2 X 25	50	50	2 Hours

SEMESTER V

Course Code	Course Name	Credits	Marks
CA21/5SS/CCV	Self-study : Computer Vision	2	100

Course Objectives:

Enable the students to

1. recognize the strengths and limitations in the field of Computer Vision.
2. create an opportunity to learn Computer vision concepts and algorithms

Course Outline:

Any one MOOC course should be chosen titled "Computer Vision" and enrolled for study. At the end of the semester assessment will be done internally. Duration of the course may vary from 4 weeks to 12 weeks.

Question Paper Pattern:

Knowledge Level	Section	Word Limit	Marks	Total	Time
K1	50 x 2 Marks	1	2	100	1.1/2 Hrs

SEMESTER V

Course Code	Course Name	Credits	Marks
CA21/5SS/DPL	Self-study : Deep Learning	2	100

Course Objectives:

Enable the students to

1. recognize the strengths and limitations in the field of Deep Learning.
2. create an opportunity to learn Deep Learning concepts and algorithms

Course Outline:

Any one MOOC course titled "Deep Learning" should be chosen and enrolled for study. At the end of the semester assessment will be done internally. Duration of the course may vary from 4 weeks to 12 weeks.

Question Paper Pattern:

Knowledge Level	Section	Word Limit	Marks	Total	Time
K1	50 x 2 Marks	1	2	100	1.1/2 Hrs

Course Code	Course Name	Credits	Marks
CA21/5SS/DAA	Self-Study: Design and Analysis of Algorithm	2	100

Course Objectives:

Enable the students to

1. demonstrate the familiarity with major algorithms and data structures.
2. analyze the asymptotic performance of the algorithms.
3. apply important algorithmic design paradigms and method of analysis.

Course outline:

Any one MOOC course should be chosen titled "Design and Analysis of Algorithm" and enrolled for study. At the end of the semester assessment will be done internally. Duration of the course may vary from 4 weeks to 12 weeks.

Question Paper Patterns:

Knowledge Level	Section	Word Limit	Marks	Total	Time
K1	50 x 2 Marks	1	2	100	1.1/2 Hrs

Course Code	Course Name	Credits	Marks
CA21/5SS/INT	Internship	2	100

Course Objectives:

Enable the students to

1. expose themselves to the software industry.

2. develop interpersonal and communication skills.

3. develop critical thinking and problem-solving skills.

4. gain knowledge about document preparation.

Course Outline:

Internship for a minimum period of 14 days has to be completed and documentation along with the Certificate of completion has to be submitted for viva-voce at the end of the semester.

Viva –Voce:

Knowledge Level	Marks	Total
K2, K3, K4, K5, K6	100	100