

**ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN
(AUTONOMOUS)**

**Re-accredited with B⁺⁺ by NAAC in 3rd cycle
(Run by Hindu Religious and Charitable Board under the Aegis of
Arulmigu Dhandayuthapani Swamy Thirukovil, Palani)
(Affiliated to Mother Teresa Women's University, Kodaikanal)
Chinnakalayamputhur(PO), Palani 624 615.**

CURRICULUM FRAMEWORK AND SYLLABUS

BACHELOR OF COMPUTER APPLICATIONS

(PROGRAMME CODE: UGBCAS)

(Based on the syllabus recommended by TANSCHÉ)

Degree Programme for the students admitted from the Academic year
2023-2024 Onwards



PG DEPARTMENT OF COMPUTER SCIENCE

ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN

INSTITUTIONAL VISION AND MISSION

VISION

- Enlightenment and Empowerment of Rural Women

MISSION

- To imbibe research activity and collaborative programs with our local communities.
- High quality teaching, providing learning environment with practical exposure.
- Encouragement of a questioning spirit and self-reliance.
- Strong and support education for the student's employability.

DEPARTMENT VISION AND MISSION

VISION

- To provide the atmosphere for students so they can create employment opportunities for themselves as well as for others.
- To prepare the students for technical training with revolutionary vision who can compete globally.

MISSION

- To provide technical education to the students through well equipped- labs.
- Giving personal attention to weaker students consequently, allowing them to cope up with others scholars.
- To provide a student – friendly environment that is amicable for practical knowledge.
- To implement the professional and communication skills of the students, working deliberately.

B.C.A

REGULATIONS

1. Preamble:

Computer Science department was established in 1998 as self supporting department with the curriculum specifically designed to reflect the depth and breadth of computer science. To encourage young rural women students to adopt higher education, M.Sc Computer Science Programme is added in the department in 2005. To bridge the gap between the studies of computers and its applications, BCA programme is introduced in the year 2008. Expert members from Academia and Industry provide inputs in introducing specialized courses in the curriculum to suit industry needs. To further enhance the quality of the program, the department adheres TANSCH 2023-2024 onwards.

2. Eligibility for Admission

- Candidate should have passed the Higher Secondary Examination conducted by the board of syndicate as equivalent there to with Mathematics.

3. Duration of the course

- The students will undergo the prescribed course of study for a period of not less than three academic years (Six semesters).

4. Medium of Instruction:

- English

5. General Framework:

- Course Study: Part I, II, III, IV, V subjects.

6. Eligibility of the degree:

- Candidates will be eligible, if they complete the course with the required credits and pass in the prescribed examinations.
- The candidate requires 75% of attendance to attend the end semester examination.
- Two internal tests will be conducted and the average of two tests will be considered for the internal mark consolidation.
- To get Graduation, the students should gain minimum 140 credits.

7. Evaluation

Pattern of Evaluation

	Int.	Ext.	Total
Theory	25	75	100
Practical	40	60	100
Project	40	60	100

Internal Assessment Components

Theory (25 Marks)

Test	-	15
Assignment	-	5
Seminar	-	5

		25

8. Content Delivery Methods

1. Lecture method
2. Group Discussion
3. ICT

9. Passing Rules

- 75% of marks are allotted for external evaluation and 25% of the marks are allotted for internal evaluation in each of the theory subjects
- 60% of marks are allotted for external evaluation and 40% of the marks are allotted for internal evaluation in each of the practical subjects.
- For each courses there will be Continuous Internal Assessment (CIA) and Final Semester Examination.
- For each paper, passing minimum is 40% in both internal and external

10. Pattern of the Question Paper (External)

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Knowledge; **K2**- Comprehend; **K3**- Applications; **K4**-Analysis; **K5**- Synthesis; **K6**-Evaluation

1. PART I, II, III

External Question Pattern: Theory – 75 Marks (3 Hours)

Bloom's Category	Section	Marks	Course Outcomes	Description	Total
K1,K2	A (Answer All) Two Questions from each unit	10*1=10	CO1 & CO2	One word/ Short Answers	75
K3 & K4	B (Either or Choice) One Questions from each unit	5*5 = 25	CO2 & CO3	Descriptive / Detailed	
K3, K4, K5 & K6	C (Answer 5 out of 8)	5*8 = 40	CO3,CO4 & CO5	Descriptive / Detailed	

Internal Question Pattern (30 Marks – 2 Hours Test)

(Converted into 15 Marks)

Bloom's Category	Section	Marks	Course Outcomes	Description	Total
K1,K2	A (Answer All)	6*1=6	CO1 & CO2	One word/ Short Answers	30 (Converted into 15 Marks)
K3,K4	B (Answer 2 out of 4)	2* 4 = 8	CO2 & CO3	Descriptive / Detailed	
K3, K4, K5 & K6	C (Answer 2 out of 4)	2*8 = 16	CO3,CO4 & CO5	Descriptive / Detailed	

PART IV (SBC & NME) – External (75 Marks – 3 Hours)

Bloom's Category	Section	Marks	Course Outcomes	Description	Total
K1,K2	A(Answer 5 out of 8)	5*3=15	CO1 & CO2	Short Answers	75
K3,K4	B(Answer 5 out of 8)	5*6=30	CO2 & CO3	Descriptive/Detailed	
K3, K4, K5 & K6	C(Answer 3 out of 5)	3*10=30	CO3,CO4 & CO5	Descriptive/Detailed	

PART IV (SBC & NME) – Internal (15 Marks – 1 Hour)

Bloom's Category	Section	Marks	Course Outcomes	Description	Total
K1,K2	A (Answer 2 out of 4)	2*2 = 4	CO1 & CO2	Short Answers	15
K3,K4	B(Answer 1 out of 2)	1*4 = 4	CO2 & CO3	Descriptive / Detailed	
K3, K4, K5 & K6	C(Answer 1 out of 2)	1*7 = 7	CO3,CO4 & CO5	Descriptive / Detailed	

Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF)

Part – I: Languages: Part – 1 comprises of category namely Tamil

Part – II: English: Part – 2 comprises of the category namely English

Part – III: Core Courses: A set of *major papers* that include Theory, Practical, Allied, Core Electives, Project and Internship in the major field of study selected by the student. Core courses are mandatory in nature.

Part – IV: Non - Major Electives (NME): A set of Non – Major Elective Courses are offered as choices of the students, outside of their major discipline. The courses other than the core and allied shall be opted by the students as Non – Major Elective.

Value Based Courses (VBC): Courses of cross-cutting issues relevant to the current pressing concerns both nationally and internationally such as environment and human values.

Skill Enhancement Courses (SEC): The courses offered as Skill Enhancement courses under Part IV of the programme is aimed at imparting Advanced Skill of the programme. This comprises of six courses from 1st to 6th semesters.

Part – V: Extension Activities: Students shall be actively participated in the extension activities.

1. Program Educational Objectives

After few years from the completion of BCA programme, the students will be able to

PEO1	To enrich knowledge in the core areas of computer science.
PEO2	To equip the students to meet the requirement of Corporate world and Industry standard.
PEO3	To engage in professional development and to pursue post graduate education in the fields of Information Technology and Computer Applications.
PEO4	Involve in lifelong learning to adapt the technological advancements in the emerging areas of computer applications.
PEO5	To inculcate team spirit for handling complex problems in data analysis and research work.

2. Programme Outcomes (PO) of BCA Programme

- Scientific aptitude will be developed in Students
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the Computer Science& humanities stream.
- Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship.
- Students will possess basic subject knowledge required for higher studies, professional and applied courses.
- Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.
- Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas. This programme helps learners in building a solid foundation for higher studies in Computer Science and applications.
- The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modeling and solving real life problems.
- Utilize computer programming skills to solve theoretical and applied problems by critical understanding,
- analysis and synthesis.
- To recognize patterns and to identify essential and relevant aspects of problems.

- Ability to share ideas and insights while seeking and be fitting from knowledge and insight of others.
 - Mould the students into responsible citizen in rapidly changing inter dependent society.
- The above expectations generally can be pooled into 6 broad categories and can be modified according to institutional requirements:

PO1 : Knowledge

PO2 : Problem Analysis

PO3 : Design/Development of Solutions

PO4 : Conduct investigations of complex problems

PO5 : Modern tool usage

PO6 : Applying to society

PO7 : Decision Making Skill

PO8 : Communication Skill

PO9 : Employability Skill

PO10 : Entrepreneurial Skill

3. Programme Specific Outcomes(PSO) of BCA Programme

PSO1: Think in a critical and logical based manner

PSO2: Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics and real time application related sciences.

PSO3: Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.

PSO4: Understand, formulate, develop programming model with logical approaches to a Address issues arising in social science, business and other contexts.

PSO5: Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.

PSO6: Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.

PSO7: Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.

PSO8: Develop a range of generic skills helpful in employment, internships& societal activities.

PSO9: Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of computing sciences.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids: (put tick mark in each row)

PO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
PO1	✓					
PO2		✓				
PO3			✓			
PO4				✓		
PO5					✓	
PO6						✓

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	13	13	22	18	92
Part IV	4	4	3	4	4	2	21
Part V	-	-	-	2	-	1	03
Total	23	23	22	25	26	21	140

MEMBERS PRESENT:

University Nominee:

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PSV
13/7/2023

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M. Ch 13/7/23

Entrepreneur Nominee:

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Spark 13/7/23

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Thangam
13/7/2023

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P.S. Darini
13/7/2023

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V. Srisandhika

CHAIRMAN:

Dr.(Mr). K.Kungumaraj, M.Sc., M.Phil., B.L.I.S., Ph.D.,

Head & Assistant Professor, PG Department of Computer Science

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E-Mail: kungumaraj72@gmail.com

K. Kungumaraj
13/7/2023

MEMBERS OF THE FACULTY:

S.No.	NAME	SIGNATURE
1.	Mrs.C.Aruna, M.Sc., M.Phil	C. Aruna
2.	Miss. P.Pavithra, M.A., M.Phil., B.Ed	P. Pavithra
3.	Mrs. P.Kavitha, MCA., M.Phil.,	P. Kavitha
4.	Mrs. M.Geetha., M.Sc., M.Phil., B.Ed	M. Geetha
5.	Mrs. J.Sangeetha., M.Sc., M.Phil., M.Ed.,	J. Sangeetha
6.	Mrs. T.Nandhini, M.Sc., M.Phil	T. Nandhini
7.	Mrs. B.Aruna Devi, M.Sc., M.Phil	B. Aruna Devi
8.	Dr.(Mrs). T.Shanmugavadivu., MCA., Ph.D	T. Shanmugavadivu
9.	Dr.(Mrs). M. Tamilselvi., M.A., M.A., M.Phil., B.Ed., Ph.D, SET, NET	M. Tamilselvi

K. Kungumaraj
13/7/2023
HEAD OF THE DEPARTMENT

A. R. S.
13/7/23
PRINCIPAL

ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN, PALANI.

PG DEPRTMENT OF COMPUTER SCIENCE

B.C.A /TANSCHÉ PRESCRIBED SYLLABUS – 2023-2024

Sem I	C	H	Sem II	C	H	Sem III	C	H	Sem IV	C	H	Sem V	C	H	Sem VI	C	H
1.1 Part 1 Language – Tamil	3	6	2.1 Part.1. Language – Tamil	3	6	3.1 Part.1. Language – Tamil	3	6	4.1 Part..1. Language – Tamil	3	6	5.1 Core – CC IX Operating System	4	5	6.1 Core – CC XIII Computer Networks	4	6
1.2 Part.2 English	3	6	2.2 Part.2 English	3	6	3.2 Part.2 English	3	6	4.2 Part.2 English	3	6	5.2 Core – CC X ASP.Net Programming	4	5	6.2 Core CC XIV Practical: ASP.NET Programming Lab	4	6
1.3 Core – CC I Python Programming	5	5	2.3 Core – CC III Object Oriented Programming Concepts using C++	5	5	3.3 Core – CC V Data Structures and Algorithms	5	5	4.3 Core – CC VII Core Programming in Java	5	5	5.3 Core CC –XI Practical : Data Analytics using R Programming	4	5	6.3 Core – CC XV Project with Viva voce	4	6
1.4 Core – CC II Practical : Python Programming	5	5	2.4 Core – CC IV Practical : C++ Programming Lab	5	5	3.4 Core – CC VI Practical: Data Structures and Algorithms Lab	5	5	4.4 Core – CC VIII Practical : Programming in Java Lab	5	5	5.4. Core CC -XII Practical : R Programming Lab	4	5	6.4 Elective -VII Generic/ Discipline Specific 1. Crptography 2. Cloud Computing	3	5
1.5 Elective I Generic/ Discipline Specific 1. Discrete Mathematics-I 2. Introduction	3	4	2.5 Elective II Generic/ Discipline Specific 1. Statistical Methods and its Application	3	4	3.5 Elective III Generic/ Discipline Specific 1. IOT and its Applications	3	4	4.5 Elective IV Generic/ Discipline Specific 1. Resource Managem	3	3	5.5 Elective V Generic/ Discipline Specific 1. Image Processing	3	4	6.5 Elective VIII generic/ Discipline Specific 1.Big Data Analytics	3	5

[illegible]

B.C.A., COMPUTER APPLICATION CURRICULUM DESIGN
FIRST YEAR – FIRST SEMESTER

Part	Sub code	List of Courses	Credit	Hours	MAX. MARKS		
					CIA	EXT	TOTAL
Part-I		Language – Tamil	3	6	25	75	100
Part-II		English	3	6	25	75	100
Part-III		CC1 - Python Programming	5	5	25	75	100
		CC2 - Practical : Python Programming	5	5	40	60	100
		Elective Course 1 - EC1: 1.Discrete Mathematics – I 2.Introduction to Linear Algebra	3	4	25	75	100
Part-IV		Skill Enhancement Course- SEC-1 (Non Major Elective) : Introduction to HTML	2	2	25	75	100
		Foundation Course FC - Structured Programming in C	2	2	25	75	100
			23	30			700

FIRST YEAR – SECOND SEMESTER

Part	Sub code	List of Courses	Credit	Hours	MAX. MARKS		
					CIA	EXT	TOTAL
Part-I		Language –Tamil	3	6	25	75	100
Part-II		English	3	6	25	75	100
Part-III		CC3 - Object Oriented Programming Concepts using C++	5	5	25	75	100
		CC4 - Practical: C++ Programming Lab	5	5	40	60	100
		Elective Course 2 – EC2 : 1.Statistical Methods and its Application - I 2.Software Metrics	3	4	25	75	100
Part-IV		Skill Enhancement Course- SEC-2 (Non Major Elective) : Fundamentals of Information Technology	2	2	25	75	100
		Skill Enhancement Course – SEC-3 : Office Automation	2	2	25	75	100
			23	30			700

SECOND YEAR – THIRD SEMESTER

Part	Sub code	List of Courses	Credit	Hours	MAX. MARKS		
					CIA	EXT	TOTAL
Part-I		Language – Tamil	3	6	25	75	100
Part-II		English	3	6	25	75	100
Part-III		CC5- Data Structures and Algorithms	5	5	25	75	100
		CC6 - Practical: Data Structures and Algorithms Lab	5	5	40	60	100
		Elective Course 3 – EC3: 1.IOT and its Applications 2.Natural Language Processing	3	4	25	75	100
Part-IV		Skill Enhancement Course -SEC-4 : Enterprise Resource Planning	2	1	25	75	100
		Skill Enhancement Course -SEC-5: Problem Solving Techniques	2	2	25	75	100
		Environmental Studies	-	1	-	-	-
			23	30			700

SECOND YEAR – FOUR SEMESTER

Part	Sub code	List of Courses	Credit	Hours	MAX. MARKS		
					CIA	EXT	TOTAL
Part-I		Language –Tamil	3	6	25	75	100
Part-II		English	3	6	25	75	100
Part-III		CC7 – Programming in Java	5	5	25	75	100
		CC8 - Practical: Programming in Java Lab	5	5	40	60	100
		Elective Course - EC4 : 1.Resource Management Techniques 2.Numerical Methods	3	3	25	75	100
Part-IV		Skill Enhancement Course – SEC-6 : Open Source Technologies	2	2	25	75	100
		Skill Enhancement Course - SEC-7 : Biometrics	2	2	25	75	100
		Environmental Studies	2	1	25	75	100
			25	30			800

THIRD YEAR – FIFTH SEMESTER

Part	Sub code	List of Courses	Credit	Hours	MAX. MARKS		
					CIA	EXT	TOTAL
Part-III		CC9 - Operating System	4	5	25	75	100
		CC10 - ASP.Net Programming	4	5	25	75	100
		CC11 - Data Analytics using R Programming	4	5	25	75	100
		CC12 – Practical: R Programming Lab	4	5	40	60	100
		Elective Course – EC5 : 1.Image Processing 2.Computational Intelligence	3	4	25	75	100
		Elective Course – EC6 : 1. Artificial Intelligence 2. Information Security	3	4	25	75	100
Part-IV		Value Education	2	2	25	75	100
		Internship / Industrial Training (Summer vacation at the end of IV semester activity)	1	-	-	100	100
			25	30			800

THIRD YEAR – SIX SEMESTER

Part	Sub code	List of Courses	Credit	Hours	MAX. MARKS		
					CIA	EXT	TOTAL
Part-III		CC13 - Computer Networks	4	6	25	75	100
		CC14 - Practical: ASP.Net Programming Lab	4	6	40	60	100
		CC15 - Project with Viva voce (Individual)	4	6	40	60	100
		Elective Course – EC7: 1.Cryptography 2.Cloud Computing	3	5	25	75	100
		Elective Course – EC8 : 1.Big Data Analytics 2.Mobile Adhoc Network	3	5	25	75	100
Part-IV		Professional Competency Skill Enhancement Course SEC8 : Quantitative Aptitude	2	2	25	75	100
Part-V		Extension Activity	1	-	100	-	100
			21	30			700

Total Credits: 140

EXTRA CREDIT PAPERS

S. No	Subject	Subject Code	Semester	Marks	Credits
1.	Understand Internet		I	100	2
2.	Tally Lab		III	100	2
3.	IPR, Plagiarism, Copyrights and Patents		V	100	2

VALUE ADDED COURSES

S. No	Subject	Subject Code	Semester	Marks
1.	Hardware and Troubleshooting		II	100
2.	Application Development in Programming Languages		IV	100
3.	Computer for Digital Era		VI	100

LIST OF SKILL ENHANCEMENT COURSES

1. **Semester II** : 1.Office Automation
2. **Semester III** : 1.Enterprise Resource Planning
2.Problem Solving Techniques
3. **Semester IV** : 1.Open Source Technologies
2. Biometrics
4. **Semester VI** : 1. Quantitative Aptitude

LIST OF ELECTIVE PAPERS**SEMESTER I:****ELECTIVE I:**

1. Discrete Mathematics – I
2. Introduction to Linear Algebra

SEMESTER II:

ELECTIVE II:

1. Statistical Methods and its Application - I
2. Software Metrics

SEMESTER III:

ELECTIVE III:

1. IOT and its Applications
2. Natural Language Processing

SEMESTER IV:

ELECTIVE IV:

1. Resource Management Techniques
2. Numerical Methods

SEMESTER V:

ELECTIVE V:

1. Image Processing
2. Computational Intelligence

ELECTIVE VI:

1. Artificial Intelligence
2. Information Security

SEMESTER VI:

ELECTIVE VII:

1. Cryptography
2. Cloud Computing

ELECTIVE VIII:

1. Big Data Analytics
2. Mobile Adhoc Network

LIST OF NME PAPERS

1. **Semester I** : Introduction to HTML
2. **Semester II** : Fundamentals of Information Technology

CORE PAPERS**❖ Theory Papers**

1. **Core I** Python Programming
2. **Core III** Object Oriented Programming Concepts using C++
3. **Core V** Data Structures and Algorithms
4. **Core VII** Programming in Java
5. **Core IX** Operating System
6. **Core X** ASP.Net Programming
7. **Core XI** Data Analytics using R Programming
8. **Core XIII** Computer Networks

❖ Practical Papers

1. **Core II** **Practical –I** Python Programming
2. **Core IV** **Practical –II** C++ Programming Lab
3. **Core VI** **Practical –III** Data Structures and Algorithms Lab
4. **Core VIII** **Practical – IV** Java Programming Lab
5. **Core XII** **Practical – V** R Programming Lab
6. **Core XIV** **Practical – VI** ASP . Net Programming

❖ **Project****1. Core XV : Project Work****DISTRIBUTION OF CORE, ALLIED, ELECTIVE, NME AND SBC**

PART I	Curriculum Structure	No. of Courses	Credits
I	Languages	04	12
II	English	04	12
III	Core Papers	15 (8 Theory + 6 Lab + 1 Project)	68
	Allied Courses	0	0
	Core Elective	08	24
IV	Non-Major Elective	02	04
	Value Based Course	01	02
	Skill Enhancement Course	06	12
	Foundation Course	01	02
	Environmental Studies	01	02
	Internship Training	01	01
V	Extension Activities	01	01
TOTAL		44	140

TOTAL MARKS : 4400

SEMESTER - I

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Python programming	Core I	5	-	-	-	5	25	75	100
Learning Objectives										
LO1	To make students understand the concepts of Python programming.									
LO2	To apply the OOPs concept in PYTHON programming.									
LO3	To impart knowledge on demand and supply concepts									
LO4	To make the students learn best practices in PYTHON programming									
LO5	To know the costs and profit maximization									
UNIT	Contents								No. of Hours	
I	Basics of Python Programming: History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. Python Arrays: Defining and Processing Arrays – Array methods.								15	
II	Control Statements: Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements.								15	
III	Functions: Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. Python Strings: String operations-Immutable Strings - Built-in String Methods and Functions - String								15	

	Comparison. Modules: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.	
IV	Lists: Creating a list -Access values in List-Updating values in Lists- Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.	15
V	Python File Handling: Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods-append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.	15
TOTAL HOURS		75
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	PO1, PO2, PO3, PO4, PO5, PO6
Text Books		
1.	Reema Thareja, “Python Programming using problem solving approach”, First Edition, 2017, Oxford University Press.	

2.	Dr. R. NageswaraRao, “Core Python Programming”, First Edition, 2017, Dream tech Publishers.
Reference Books	
1.	Vamsi Kurama, “Python Programming: A Modern Approach”, Pearson Education.
2.	Mark Lutz, ”Learning Python”, Orielly.
3.	Adam Stewarts, “Python Programming”, Online.
4.	Fabio Nelli, “Python Data Analytics”, A Press.
5.	Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication.
Web Resources	
1.	https://www.programiz.com/python-programming
2.	https://www.guru99.com/python-tutorials.html
3.	https://www.w3schools.com/python/python_intro.asp
4.	https://www.geeksforgeeks.org/python-programming-language/
5.	https://en.wikipedia.org/wiki/Python_(programming_language)

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	M	M	M	S	M
CO2	S	S	S	S	S	M	S	M	S	M
CO3	S	S	S	S	S	M	S	M	S	M
CO4	M	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	M	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	3	3
CO2	3	2	2	3	2	3
CO3	3	2	2	3	2	2
CO4	3	2	2	3	2	3
CO5	3	2	2	3	3	3
Weightage of course contributed to each PSO	15	10	10	15	13	14
Weighted % of Course Contribution to POs	3	2	2	3	2.6	2.8

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER - I

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Python Programming Lab	Core II	-	-	5	-	5	40	60	100
Learning Objectives										
LO1	Be able to design and program Python applications.									
LO2	Be able to create loops and decision statements in Python.									
LO3	Be able to work with functions and pass arguments in Python.									
LO4	Be able to build and package Python modules for reusability.									
LO5	Be able to read and write files in Python.									
S.NO	LAB EXERCISES								No. of Hours	
1.	Program using variables, constants, I/O statements in Python.								60	
2.	Program using Operators in Python.									
3.	Program using Conditional Statements.									
4.	Program using Loops.									
5.	Program using Jump Statements.									
6.	Program using Functions.									
7.	Program using Recursion.									
8.	Program using Arrays.									
9.	Program using Strings.									

10.	Program using Modules.	
11.	Program using Lists.	
12.	Program using Tuples.	
13.	Program using Dictionaries.	
14.	Program for File Handling.	
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Demonstrate the understanding of syntax and semantics of PYTHON language	
CO2	Identify the problem and solve using PYTHON programming techniques.	
CO3	Identify suitable programming constructs for problem solving.	
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.	
CO5	Develop a PYTHON program for a given problem and test for its correctness.	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	M	M	M	S	S
CO2	S	S	S	S	M	M	S	M	S	M
CO3	S	S	S	S	S	M	S	M	S	M
CO4	M	S	S	S	S	M	S	M	S	M
CO5	S	S	S	M	S	M	S	M	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	2	3	2
CO2	2	2	3	3	3	2
CO3	3	3	2	2	2	3
CO4	2	3	3	3	3	2
CO5	3	2	3	3	2	3
Weightage of course contributed to each PSO	12	12	13	13	13	12
Weighted % of Course Contribution to POs	2.4	2.4	2.6	2.6	2.6	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER - I

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Discrete Mathematics – I	Elective I	-	4	-		3	25	75	100
Learning Objectives										
LO1	To understand the mathematical concepts like set theory, logics, number theory, combinatory and relations.									
LO2	To Explain the Relations concepts and their properties									
LO3	To know the Applications of recurrence relations									
LO4	To understand the Graphs and Graphs models									
LO5	To explain the Matrices concepts									
UNIT	Contents								No. of Hours	
I	SET THEORY: Introduction- set and Its Element – Set Description (Roster, Set Builder and cardinal number method) Types of Sets- Set Operations and Laws of set Theory. Partition of sets. Countable and uncountable set. Algebra of sets and Duality								12	
II	MATHEMATICAL LOGIC: Basic Logic and Proof, logical operations – Logic Propositional equivalence, Predicates and Quantities, Tautology- Contradiction- Function- Definition- Notation- Types of Function- Composition of Functions-								12	
III	NUMBER THEORY: The Integer and Division, Integers and Algorithms, Multiplication, Addition and Division –Sequences and Summation, Recursive								12	

	Algorithms.	
IV	COMBINATORICS: The basics of counting, the pigeonhole principle, Permutations and Combinations, Binomial coefficients, Generalized permutations and combinations	12
V	RELATIONS: Relations – Relations and their properties, Representing Relations, Closures of relations, Equivalence relations, Partial orderings.	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	To understand the mathematical concepts like set theory, logics, number theory, combinatory and relations.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	To understand different mathematical logics and functions	PO1, PO2, PO3, PO4, PO5, PO6
CO3	To understanding the different form of number theory	PO1, PO2, PO3, PO4, PO5, PO6
CO4	To gain knowledge on set theory	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Able to understand Relations and its applications	PO1, PO2, PO3, PO4, PO5, PO6
Text Books		
1.	Discrete Mathematics and its applications, Seventh Edition, Kenneth. H. Rosen, McGraw Hill Publishing Company, 2012.	
2.	Discrete Mathematics, M.Venkataraman, N.Sridharan and N.Chandrasekaran, The National Publishing Company, 2009. Unit I : Textbook 1 Chapter 1: Sections: 1.1, 1.2, 1.3, 1.4, 1.6 Unit II : Textbook 1 Chapter 9: Sections: 9.1, 9.3, 9.4, 9.5, 9.6	

	Unit III : Textbook 1 Chapter 6: Sections: 6.1, 6.2, 6.3 Chapter 8: Sections: 8.1, 8.2, 8.3 (Pages: 527 -529 only) (Exclude algorithms and relations, on page 507 and its related problems) Unit IV : Textbook 1 Chapter 10: Sections: 10.1, 10.2, 10.3, 10.4, 10.6) Unit V : Textbook 2 Chapter 6 :Sections :6.1 to 6.5, and 6.7)
3.	J.K Sharma “DISCRETE MATHEMATICS” 3 rd Edition Macmillan Reprint 2011
Reference Books	
1.	Modern Algebra - S.Arumugam and A. Thangapandi Isaac, Scitech publications 2005.
2.	Invitation to Graph Theory-S.Arumugam and S.Ramachandran, Scitech Publications, 2005, Chennai.
3.	Discrete Mathematical Structures with applications to Computer Science - Tremblay and Manohar, McGraw Hill, 1997.
Web Resources	
1.	Web resources from NDL Library, E-content from open-source libraries

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	M	S	M
CO2	S	S	S	S	S	M	S	M	S	M
CO3	S	M	S	S	S	M	M	M	S	M
CO4	S	S	S	S	M	M	S	M	S	S
CO5	S	S	S	S	S	M	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	2	3
CO3	3	3	3	3	2	2
CO4	3	3	3	3	2	3
CO5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	14	15	15	13	14
Weighted % of Course Contribution to POs	3	2.8	3	3	2.6	2.8

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER - I

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Introduction to Linear Algebra	Elective I	-	4	-		3	25	75	100
Learning Objectives										
LO1	Introduce students to the theory of systems of linear equations and to mathematical proof									
LO2	To explain the concepts Matrix of a linear transformation.									
LO3	To understanding the Inner product Spaces									
LO4	To explain the Matrices									
LO5	To understanding the Bilinear forms									
UNIT	Contents								No. of Hours	
I	Vector spaces: Definitions and Examples – Subspaces – Linear Transformations - Span of a set.								12	
II	Linear independence – Basis and dimensions – Rank and Nullity - Matrix of a linear transformation.								12	
III	Inner product Spaces: Definition and examples – Orthogonality – Orthogonal Complement.								12	
IV	Matrices – Elementary transformations – Rank of a matrix – Simultaneous linear equations – Characteristic equations and Cayley Hamilton theorem – Eigen values and eigen vectors.								12	
V	Bilinear forms – Quadratic forms.								12	
TOTAL HOURS								60		

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	The concepts of linear algebra are crucial for understanding the theory behind machine learning, especially for deep learning.	PO1,PO2, PO3, PO4, PO5,PO6
CO2	Prove statements of an algebraic nature concerning linear transformations	PO1,PO2, PO3, PO4, PO5,PO6
CO3	Calculate eigen values and their corresponding eigen spaces	PO1,PO2, PO3,PO4, PO5, PO6
CO4	Determine Rank of a matrix	PO1,PO2, PO3,PO4, PO5, PO6
CO5	Understand algebraic and geometric representations	PO1,PO2, PO3,PO4, PO5, PO6
Text Books		
1.	Dr. S. Arumugam and Prof. A. Thangapandi Isaac, Modern Algebra, SciTech Publication, India Private Ltd., January 2018. Unit I: Chapter 5 – Sections 1, 2, 3 and 4 Unit II: Chapter 5 – Sections 5, 6, 7 and 8 Unit III: Chapter 6 – Sections 1, 2 and 3 Unit IV: Chapter 7 – Sections 4, 5, 6, 7 and 8 Unit V: Chapter 8 – Sections 1 and 2.	
Reference Books		
1.	I. N. Herstein, Topics in Algebra, Wiley Eastern Ltd, 2006.	
2.	A. R. Vasishtha, Modern Algebra, Krishna Publication, January 2015	

Web Resources	
1.	Web resources from NDL Library, E-content from open-source libraries

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	M	S	M
CO2	S	S	S	M	S	S	S	M	S	S
CO3	M	S	S	S	S	S	S	M	S	S
CO4	S	S	M	S	S	M	S	M	S	M
CO5	S	S	S	S	M	M	S	M	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	2	3	3	3	3	3
CO3	3	3	2	3	3	2
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	14	15	14	15	15	14
Weighted % of Course Contribution to POs	2.8	3	2.8	3	3	2.8

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER - I

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Introduction to HTML	Skill Enha. Course (SEC) I	2	-	-		2	25	75	100
Learning Objectives										
LO1	Insert a graphic within a web page.									
LO2	Create a link within a web page.									
LO3	Create a table within a web page.									
LO4	Insert heading levels within a web page.									
LO5	Insert ordered and unordered lists within a web page. Create a web page.									
UNIT	Contents								No. of Hours	
I	Introduction: Web Basics: What is Internet – Web browsers – What is Web page – HTML Basics: Understanding tags.								6	
II	Tags for Document structure (HTML, Head, Body Tag). Block level text elements: Headings paragraph (<p> tag)–Font style elements: (bold, italic, font, small, strong, strike, big tags)								6	
III	Lists: Types of lists: Ordered, Unordered– Nesting Lists– Other tags: Marquee, HR, BR - Using Images –Creating Hyperlinks.								6	
IV	Tables: Creating basic Table, Table elements, Caption–Table and cell alignment–Row span, Cols pan– Cell padding.								6	
V	Frames: Frameset– Targeted Links– No frame – Forms: Input, Text area, Select, Option.								6	

TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Knows the basic concept in HTML Concept of resources in HTML	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows Design concept. Concept of Meta Data Understand the concept of save the files.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the page formatting. Concept of list	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Creating Links. Know the concept of creating link to email address	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Concept of adding images Understand the table creation.	PO1, PO2, PO3, PO4, PO5, PO6
Text Books		
1.	“Mastering HTML5 and CSS3 Made Easy”, Teach U Comp Inc., 2014.	
2.	Thomas Michaud, “Foundations of Web Design: Introduction to HTML & CSS”	
Reference Books		
1.	“HTML The Basics of Designing Wed pages” by S. Sydhani Begum	
Web Resources		
1.	https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf	
2.	https://www.w3schools.com/html/default.asp	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	M	S	M	S	M	S	S
CO2	S	S	S	S	S	M	S	S	S	M
CO3	S	S	S	S	M	M	S	S	S	M
CO4	S	M	S	S	S	M	S	S	S	M
CO5	S	S	S	M	S	M	S	M	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	3	3
CO3	2	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15
Weighted % of Course Contribution to POs	2.8	3	2.8	2.8	3	3

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER - I

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Structured Programming in C	FC	2	-	-	-	2	25	75	100
Learning Objectives										
LO1	To familiarize the students with the Programming basics and the fundamentals of C, Data types in C, Mathematical and logical operations.									
LO2	To understand the concept using if statements and loops									
LO3	This unit covers the concept of Arrays									
LO4	This unit covers the concept of Functions									
LO5	To understand the concept of implementing pointers.									
UNIT	Contents								No. of Hours	
I	Overview of C: Importance of C, C program structure, executing C program. Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration of variables, Assigning values to variables-Assignment statement, declaring a variable as constant as volatile. Operators and Expression.								6	
II	Decision Making and Branching: Decision making with If, simple IF, IF ELSE, nested IF ELSE, ELSE IF ladder, switch, GOTO statement. Decision Making and Looping: While, Do-While, For, Jumps in loops.								6	
III	Arrays: Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional arrays.								6	
IV	Functions: The form of C functions, Return values and types, calling a								6	

	function, categories of functions, Nested functions, Recursion, functions with arrays, call by value, call by reference-string functions.	
V	Pointers: definition, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays.	6
TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Remember the program structure of C with its syntax and semantics	PO1,PO3, PO5
CO2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2,PO3, PO6
CO3	Apply the programming principles learnt in real-time problems	PO3,PO4, PO5
CO4	Analyze the various methods of solving a problem and choose the best method	PO4,PO5, PO6
CO5	Code, debug and test the programs with appropriate test cases	PO5,PO6
Text Books		
1.	E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill, 2010.	
Reference Books		
1.	Byron Gottfried, Schaum’s Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018.	
2.	Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998	
3.	Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications,2021	
Web Resources		
1.	https://codeforwin.org/	
2.	https://www.geeksforgeeks.org/c-programming-language/	

3.	http://en.cppreference.com/w/c
4.	http://learn-c.org/
5.	https://www.cprogramming.com/

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	S	M	S	M
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	M	S	M	S
CO4	S	M	S	S	S	S	S	M	S	M
CO5	S	S	S	M	S	M	M	S	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	3	3	3	2
CO2	2	3	3	2	2	3
CO3	3	2	2	3	2	2
CO4	3	3	3	2	2	2
CO5	2	2	2	3	3	3
Weightage of course contributed to each PSO	12	12	13	13	12	12
Weighted % of Course Contribution to POs	2.4	2.4	2.6	2.6	2.4	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – II

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++	Core III	5	-	-	-	5	25	75	100
Learning Objectives										
LO1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, Data and objects									
LO2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc									
LO3	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism									
LO4	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming									
LO5	Demonstrate the use of various OOPs concepts with the help of programs									
UNIT	Contents							No. of Hours		
I	Introduction to C++: key concepts of Object-Oriented Programming – Advantages–Object Oriented Languages–I/O In C++–C++Declarations. Control Structures :- Decision Making and Statements : If..else , jump, goto , break, continue, Switch case statements - Loops in C++ :for, while, do - functions in C++ - inline functions – Function Overloading.							15		
II	Classes and Objects: Declaring Objects – Defining Member Functions –Static Member variables and functions–array of objects–friend functions – Overloading member functions – Bit fields and classes –Constructor and destructor with static members							15		
III	Operator Overloading: Overloading unary, binary operators–Overloading Friend functions –type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal, Hybrid, Multi path inheritance–							15		

	Virtual base Classes–Abstract Classes	
IV	Pointers: Declaration–Pointer to Class, Object–this pointer–Pointers to derived classes and Base classes – Arrays – Characteristics – array of classes – Memory models – new and delete operators – dynamic object –Binding, Polymorphism and Virtual Functions	15
V	Files: File stream classes –file modes–Sequential Read /Write operations– Binary and ASCII Files–Random Access Operation–Templates –Exception Handling- String –Declaring and Initializing string objects–String Attributes– Miscellaneous functions.	15
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	Upon completion of the course the students would be able to	
CO1	Remember the program structure of C with its syntax and semantics	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures ,pointers and files)	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply the programming principles learn in real-time problems	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Analyze the various methods of solving a problem and choose the best method	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Code, debug and test the programs with appropriate test cases	PO1, PO2, PO3, PO4, PO5, PO6
Text Books		
1.	E.Balagurusamy,–Object-OrientedProgrammingwithC++ ,TMH2013,7thEdition.	
Reference Books		
1.	Ashok N Kamthane,–Object-Oriented Programming with ANSI and Turbo C++ , PearsonEducation2003.	

2.	Maria Litvin & Gray Litvin, -C++ for you all, Vikas publication 2002.
Web Resources	
1.	https://alison.com/course/introduction-to-c-plus-plus-programming

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	M	M	M	S	M
CO2	S	S	M	S	S	M	S	M	M	M
CO3	S	S	S	S	S	M	S	M	S	M
CO4	M	M	S	M	S	M	S	M	S	M
CO5	S	S	S	S	M	M	S	M	S	M

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	3	2
CO2	2	2	2	3	2	3
CO3	3	3	3	2	3	2
CO4	2	2	2	2	2	3
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	12	12	13	12	13	12
Weighted % of Course Contribution to POs	2.4	2.4	2.6	2.4	2.6	2.4

*S-Strong-3; M-Medium-2 ; L-Low-1;

SEMESTER – II

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	C++ PROGRAMMING LAB	Core IV	-	-	5	-	5	40	60	100
Learning Objectives										
LO1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects									
LO2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc									
LO3	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism									
LO4	Classify inheritance with the understanding of early and late binding, usage of exception handling ,generic programming									
LO5	Demonstrate the use of various OOPs concepts with the help of programs									
S.NO	LAB EXERCISES								No. of Hours	
1.	Write a C++ program to demonstrate function overloading, Default Arguments and Inline function.								60	
2.	Write a C++program to demonstrate Class and Objects									
3.	Write a C++program to demonstrate the concept of Passing Objects to Functions									
4.	Write a C++ program to demonstrate the Friend Functions.									
5.	Write a C++ program to demonstrate the concept of Passing Objects to Functions									

6.	Write a C++ program to demonstrate Constructor and Destructor	
7.	Write a C++ program to demonstrate Unary Operator Overloading	
8.	Write a C++ program to demonstrate Binary Operator Overloading	
9.	Write a C++ program to demonstrate: Single Inheritance Multilevel Inheritance Multiple Inheritance Hierarchical Inheritance Hybrid Inheritance	
10.	Write a C++ program to demonstrate Virtual Functions.	
11.	Write a C++ program to manipulate Text File.	
12.	Write a C++ program to perform Sequential I/O Operations on a file.	
13.	Write a C++ program to find the Biggest Number using Command Line Arguments	
14.	Write a C++ program to demonstrate Class Template	
15.	Write a C++ program to demonstrate Function Template.	
16.	Write a C++ program to demonstrate Exception Handling.	
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	Upon completion of the course the students would be able to	
CO1	Remember the program structure of C with its syntax and semantics	PO1,PO6
CO2	Understand the programming principles in C(data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2
CO3	Apply the programming principles learnt in real-time problems	PO4,PO7

CO4	Analyze the various methods of solving a problem and choose the best method	PO6
CO5	Code, debug and test the programs with appropriate test cases	PO7,PO8

Text Books	
1.	E.Balagurusamy, –Object-Oriented Programming with C++ ,TMH2013,7thEdition.
Reference Books	
1.	Ashok N Kamthane,–Object-Oriented Programming with ANSI and Turbo C++ , Pearson Education2003.
2.	Maria Litvin & Gray Litvin, –C++foryou ,Vikas publication2002.
Web Resources	
1.	https://alison.com/course/introduction-to-c-plus-plus-programming

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	M	M	M	M	S	M
CO2	S	S	M	S	S	M	S	M	M	M
CO3	M	S	S	S	S	M	S	M	S	M
CO4	S	S	S	S	S	M	S	M	S	M
CO5	S	M	S	S	M	M	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	2	3
CO2	2	3	3	3	2	2
CO3	2	3	3	3	3	2
CO4	3	3	3	3	3	2
CO5	2	3	3	3	2	3
Weightage of course contributed to each PSO	12	15	15	15	12	12
Weighted % of Course Contribution to POs	2.4	3	3	3	2.4	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – II

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Statistical Methods and its Application-I	Elective II	4	-	-		3	25	75	100
Learning Objectives										
LO1	To make understand the fundamentals of Statistics.									
LO2	Define the principal concepts about probability.									
LO3	To explain the Coefficient of Variation									
LO4	To understand the concept of Conditional Probability									
LO5	Explain the concept of a random variable and the probability distributions.									
UNIT	Contents								No. of Hours	
I	Introduction to statistics – primary and secondary data – Diagrammatic Representation of statistical data – Bar- charts, Pie-diagrams – Graphical Representation of data – Histograms, Frequency polygon.								12	
II	Measures of dispersion – characteristics – coefficient of dispersion - Coefficient of variation – Moments – skewness and kurtosis – Pearson’s coefficient of skewness - Bowley’s coefficient of Skewness – Coefficient of skewness based upon moments.								12	
III	Simple correlation – Karl Pearson’s coefficient of correlation – correlation coefficient for A bivariate frequency distribution – Rank correlation – Regression –lines of regression – Properties of regression coefficient.								12	
IV	Events and sets – sample space – concept of probability – addition and multiplications Theorem on probability – conditional probability and								12	

	independence of events – Baye’s Theorem – concept of random variable – Mathematical Expectation.	
V	Concept of sampling distributions – standard error – Tests of significance Based on t, Chi-square and F distributions with respect to mean, variance.	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Summarize the concepts of statistical methods	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Analyses the different Statistical measures of data	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Derive the marginal and conditional distributions of random variables, translate real world problems into probability models	PO1, PO2, PO3, PO4, PO5, PO6
CO4	To understanding the concepts of Probability of an event	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand basic probability axioms and rules and the moments of discrete and continuous random variables as well as be familiar with common named discrete and continuous random variables	PO1, PO2, PO3, PO4, PO5, PO6
Text Books		
1.	Statistical Methods, S.P.Gupta, Sultan Chand and sons Publications,4th Edition 2011	
Reference Books		
1.	Statistics, Dr. S.Arumugam and A.Thangapandi Issac, New Gamma Publication house, 2002.	
2.	Kishor S. Trivedi - Probability and statistics with reliability queuing and Computer Science Applications - Prentice Hall of India (P) Ltd., New Delhi -1997	
3.	Discrete Mathematics - Seymour Lipschutz, Marc Lars Lipson Schaum.s Outlines- by, 3rd Edition., Tata McGraw Hill, Education	

	Pvt. Ltd., New Delhi. 5th Reprint, 2012
Web Resources	
1.	Web resources from NDL Library, E-content from open-source libraries

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	M	S	S	S	M	M	S	S
CO4	S	S	S	S	S	S	S	M	S	M
CO5	M	S	S	S	S	M	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	2	3
CO3	3	3	3	3	3	3
CO4	3	2	3	3	3	3
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	15	15	14	15
Weighted % of Course Contribution to POs	3	2.8	3	3	2.8	3

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – II

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Software Metrics	Elective II	4	-	-		3	25	75	100
Learning Objectives										
LO1	Gain a solid understanding of what software metrics are and their significance									
LO2	Learn how to identify and select appropriate software metrics based on project goals									
LO3	Acquire knowledge and skills in collecting and measuring software metrics									
LO4	Learn how to analyze and interpret software metrics data to extract valuable insights									
LO5	Gain the ability to evaluate software quality using appropriate metrics									
UNIT	Contents								No. of Hours	
I	Fundamentals of Measurement : Need for Measurement: Measurement in Software Engineering, Scope of Software Metrics, The Basics of measurement: There presentational theory of measurement, Measurement and models, Measurement scales and Scale types ,meaningfulness in measurement								12	
II	A Goal-Based Framework For Software Measurement: Classifying software measures, Determining what to Measure, Applying the framework Software measurement validation, Performing Software Measurement Validation Empirical investigation: Principles of Empirical Studies, Planning Experiments, Planning case studies as quasi experiments, Relevant and Meaningful Studies								12	

III	<p>Software Metrics Data Collection: Defining good data, Data collection for incident reports, How to collect data, Reliability of data collection Procedures</p> <p>Analyzing software measurement data: Statistical distributions and hypothesis testing, Classical data analysis techniques ,Examples of simple analysis techniques</p>	12
IV	<p>Measuring internal product attributes: Size Properties of Software Size, Code size, Design size, Requirements analysis and Specification size, Functional size measures and estimators, Applications of size measures</p> <p>Measuring internal product attributes: Structure: Aspects of Structural Measures, Control flow structure of program units, Design-level Attributes, Object-oriented Structural attributes and measures</p>	12
V	<p>Measuring External Product Attributes: Modeling, software quality, Measuring aspects of quality, Usability Measures, Maintainability measures, Security Measures</p> <p>Software Reliability: Measurement and Prediction :Basics of reliability theory, The software reliability problem, Parametric reliability growth models, Predictive accuracy</p>	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand various fundamentals of measurement and software metrics.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Identify framework and analysis techniques for software measurement	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply internal and external attributes of software product for effort estimation	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Use appropriate analytical techniques to interpret software metrics data and	PO1, PO2, PO3, PO4,

	derive Meaningful insights	PO5, PO6
CO5	Recommend reliability models for predicting software quality	PO1, PO2, PO3, PO4, PO5, PO6
Text Books		
1.	Daniel Jurafsky, James H. Martin, “Speech & language processing”, Pearson publications.	
2.	Allen, James. Natural language understanding. Pearson, 1995.	
Reference Books		
1.	Pierre M. Nugues, “An Introduction to Language Processing with Perl and Prolog”, Springer	
Web Resources		
1.	https://en.wikipedia.org/wiki/Natural_language_processing	
2.	https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	M	M	M	S	M
CO2	S	S	S	S	S	M	S	S	S	M
CO3	M	S	S	S	M	M	S	S	S	M
CO4	S	S	M	M	M	M	S	M	S	M
CO5	S	S	S	S	S	M	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	3	3	2
CO2	3	3	3	3	3	3
CO3	3	2	2	2	3	3
CO4	2	3	3	3	2	3
CO5	2	2	2	3	3	3
Weightage of course contributed to each PSO	12	12	12	14	14	14
Weighted % of Course Contribution to POs	2.4	2.4	2.4	2.8	2.8	2.8

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – II

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Fundamentals of Information Technology	Skill Enha. Course (SEC) II	2	-	-	-	2	25	75	100
Learning Objectives										
LO1	Understand the basic concepts and terminology of information technology.									
LO2	Have a basic understanding of personal computers and their operation									
LO3	Be able to identify data storage and its usage									
LO4	Get great knowledge of software and its functionalities									
LO5	Understand about operating system and their uses									
UNIT	Contents								No. of Hours	
I	Introduction to Computers: Generations of Computer–Data and Information – Components of Computer – Software – Hardware – Input Devices-Output Devices—Types of Operating System								6	
II	MS Word: Introduction–Elements of Window–Files, Folders and Directories – Text Manipulating: Cut, Copy, Paste, Drag and Drop – Text Formatting: Font – Style, Size, Face and Colors (Both foreground and background)–Alignment-Bullets and Numbering-Header and footer-Watermark– Inserting objects(images, other application document)–Table creation – Mail merge.								6	
III	Ms Excel: Introduction–Inserting rows and columns–Sizing rows and columns–Implementing formulas–Generating series-Functions in excel								6	

	–CreationofChart–Insertingobjects–Filter–Sorting–Insertingworksheet	
IV	MS Power Point: Introduction Slides Manipulation(Inserting new, Copy, paste, delete and duplicate slides) –Slide show– Types of Views – Types of Animations–Inserting Objects–Implementing multimedia(Video and Audio)– Templates(Built-in and User-Defined).	6
V	Internet: Introduction to Internet and Intranet–Services of Internet- Domain Name – URL – Browser – Types of Browsers – Search Engine - E-Mail – Basic Components of E-Mail –.How to send group mail . E-Commerce: Digital Signature–Digital Currency–Online shopping and transaction.	6
TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop organizational structure using for the devices present currently under input or output unit.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of storing data in computer using two header namely RAM and ROM with different types of ROM with advancement in storage basis.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with different software, Write program in the software and applications of software.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of Operating system in information technology which really acts as a interpreter between software and hardware.	PO1, PO2, PO3, PO4, PO5, PO6
Text Books		
1.	Anoop Mathew, S. Kavitha Murugesan (2009), “Fundamental of Information Technology”, Majestic Books.	
2.	Alexis Leon, Mathews Leon,” Fundamental of Information Technology”, 2 nd Edition.	

3.	S. K Bansal, “Fundamental of Information Technology”.
Reference Books	
1.	Bhardwaj Sushil Puneet Kumar, “Fundamental of Information Technology”
2.	GG WILKINSON, “Fundamentals of Information Technology”, Wiley-Blackwell
3.	A Ravichandran , “Fundamentals of Information Technology”, Khanna Book Publishing
Web Resources	
1.	https://testbook.com/learn/computer-fundamentals
2.	https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html
3.	https://www.javatpoint.com/computer-fundamentals-tutorial
4.	https://www.tutorialspoint.com/computer_fundamentals/index.htm
5.	https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	S	S	S
CO2	S	S	S	S	M	S	S	S	S	M
CO3	S	S	S	S	S	M	S	M	S	S
CO4	S	S	M	S	S	M	S	S	S	M
CO5	M	S	S	S	S	M	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	2	2
CO2	3	2	3	2	3	3
CO3	3	2	2	2	2	3
CO4	2	3	3	3	3	2
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	13	13	13	12	13	12
Weighted % of Course Contribution to POs	2.6	2.6	2.6	2.4	2.6	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – II

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Office Automation	Skill Enha. Course (SEC) III	2	-	-	-	2	25	75	100
Learning Objectives										
LO1	Understand the basics of computer systems and its components.									
LO2	Understand and apply the basic concepts of a word processing package.									
LO3	Understand and apply the basic concepts of electronic spreadsheet software.									
LO4	Understand and apply the basic concepts of database management system.									
LO5	Understand and create a presentation using PowerPoint tool.									
UNIT	Contents								No. of Hours	
I	Introductory concepts: Memory unit – CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems & its features: DOS– UNIX– Windows. Introduction to Programming Languages.								6	
II	Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets; Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing– Preview, options, merge.								6	
III	Spreadsheets: Excel– opening, entering text and data, formatting, navigating; Formulas – entering, handling and copying; Charts– creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.								6	

IV	Database Concepts: The concept of data base management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of data files; Understanding Programming environment in DBMS; Developing menu drive applications in query language(MS–Access).	6
V	Power point: Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition– Animation effects, audio inclusion, timers.	6
TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Possess the knowledge on the basics of computers and its components	PO1,PO2, PO3,PO6, PO8
CO2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1,PO2, PO3,PO6
CO3	Learn the concepts of Database and implement the Query in Database.	PO3,PO5, PO7
CO4	Demonstrate the understanding of different automation tools.	PO3,PO4, PO5,PO7
CO5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4,PO6, PO7,PO8
Text Books		
1.	Peter Norton, “Introduction to Computers”– Tata McGraw-Hill.	
Reference Books		
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGrawHill.	
Web Resources		
1.	https://www.udemy.com/course/office-automation-certificate-course/	

2.	https://www.javatpoint.com/automation-tools
3.	https://www.udemy.com/course/office-automation-certificate-course/

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	M	S	S	S
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	S	M	S	M	M	M	S	M
CO4	S	M	S	S	S	M	S	S	S	M
CO5	S	S	S	M	S	M	S	M	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	3	3	3	2
CO2	3	2	3	3	3	3
CO3	3	2	2	2	2	3
CO4	3	3	2	2	2	2
CO5	2	3	3	3	2	3
Weightage of course contributed to each PSO	13	12	13	13	12	13
Weighted % of Course Contribution to POs	2.6	2.4	2.6	2.6	2.4	2.6

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – III

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Data Structure And Algorithms	Core V	5	-	-	-	5	25	75	100
Learning Objectives										
LO1	To understand the concepts of ADTs									
LO2	To learn linear data structures-lists, stacks, queues									
LO3	To learn Tree structures and application of trees									
LO4	To learn graph structures and application of graphs									
LO5	To understand various sorting and searching									
UNIT	Contents								No. of Hours	
I	Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementation singly linked lists-circular linked lists-doubly-linked lists-applications of lists-Polynomial Manipulation- All operations-Insertion-Deletion-Merge-Traversal								15	
II	Stack ADT-Operations- Applications- Evaluating arithmetic expressions – Conversion of infix to postfix expression-Queue ADT-Operations-Circular Queue- Priority Queue- de Queue applications of queues.								15	
III	Tree ADT-tree traversals-Binary Tree ADT-expression trees-applications of trees-binary search tree ADT- Threaded Binary Trees-AVL Trees- B-Tree- B+ Tree – Heap-Applications of heap.								15	
IV	Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal-Topological sort- Bi-connectivity – Cut								15	

	vertex- Euler circuits-Applications of graphs.	
v	Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort-Radix sort-Hashing-Hash functions-Separate chaining- Open Addressing-Rehashing Extendible Hashing	15
TOTAL HOURS		75
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO6
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2
CO3	Describe the hash function and concepts of collision and its resolution methods	PO2,PO4
CO4	Solve problem involving graphs, trees and heaps	PO4,PO6
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO5,PO6
Text Books		
1.	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.	
2.	Reema Thareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition	
Reference Books		
1.	Thomas H. Cormen, Chales E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, McGraw Hill 2009, 3rd Edition.	
2.	Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education 2003	
Web Resources		
1.	https://www.programiz.com/dsa	

2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/
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Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	S	M	S	S	M
CO2	S	S	S	S	S	M	S	M	S	M
CO3	S	M	S	S	S	M	S	M	S	M
CO4	S	S	S	S	S	M	S	M	S	M
CO5	M	S	S	S	M	M	S	S	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	2	3
CO2	2	2	2	2	3	2
CO3	3	3	2	2	3	2
CO4	2	2	2	3	3	2
CO5	3	2	3	2	2	3
Weightage of course contributed to each PSO	13	12	12	12	13	12
Weighted % of Course Contribution to POs	2.6	2.4	2.4	2.4	2.6	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – III

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Data Structure and Algorithms Lab	Core VI	-	-	5	-	5	40	60	100
Learning Objectives										
LO1	To understand the concepts of ADTs									
LO2	To learn linear data structures-lists, stacks, queues									
LO3	To learn Tree structures and application of trees									
LO4	To learn graph structures and application of graphs									
LO5	To understand various sorting and searching									
S. NO	LAB EXERCISES								No. of Hours	
1.	Write a program to implement the List ADT using arrays and linked lists.								60	
2.	Write a programs to implement the following using a singly linked list. <ul style="list-style-type: none"> Stack ADT Queue ADT 									
3.	Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).									
4.	Write a program to implement priority queue ADT.									
5.	Write a program to perform the following operations: <ul style="list-style-type: none"> Insert an element into a binary search tree. 									

	<ul style="list-style-type: none"> Delete an element from a binary search tree. Search for a key element in a binary search tree. 	
6.	Write a program to perform the following operations <ul style="list-style-type: none"> Insertion into an AVL-tree Deletion from an AVL-tree 	
7.	Write a program for the implementation of BFS and DFS for a given graph.	
8.	Write a programs for implementing the following searching methods: <ul style="list-style-type: none"> Linear search Binary search. 	
9.	Write a programs for implementing the following sorting methods: <ul style="list-style-type: none"> Bubble sort Selection sort Insertion sort Radix sort. 	
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO4, PO5
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO1,PO4, PO6
CO3	Describe the hash function and concepts of collision and its resolution methods	PO1,PO3, PO6
CO4	Solve problem involving graphs, trees and heaps	PO3,PO4
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO1,PO5, PO6
Text Books		

1.	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.
2.	Reema Thareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition
Reference Books	
1.	Thomas H.Cormen, Chales E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, McGraw Hill 2009, 3rd Edition
2.	Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education 2003
Web Resources	
1.	https://www.programiz.com/dsa
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	M	S	S
CO2	S	S	M	S	S	M	S	S	S	M
CO3	S	S	S	S	M	S	S	M	S	S
CO4	M	S	S	S	S	M	S	S	S	M
CO5	S	S	M	S	S	S	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	2	2	3
CO2	2	2	2	3	2	3
CO3	3	2	2	3	2	2
CO4	2	2	3	2	3	3
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	13	12	12	13	12	13
Weighted % of Course Contribution to POs	2.6	2.4	2.4	2.6	2.4	2.6

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – III

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Internet of Things and its applications	Elective III	4	-	-	-	3	25	75	100
Learning Objectives										
LO1	Use of Devices, Gateways and Data Management in IoT.									
LO2	Design IoT applications in different domain and be able to analyze their performance									
LO3	Implement basic IoT applications on embedded platform									
LO4	To gain knowledge on Industry Internet of Things									
LO5	To Learn about the privacy and Security issues in IoT									
UNIT	Contents								No. of Hours	
I	IoT & Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.								12	
II	M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.								12	

III	IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	12
IV	IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management.	12
V	Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security.	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Learn No SQL databases and management.	PO3, PO5
Text Books		
1.	Vijay Madisetti and Arshdeep Bahga, “Internet of Things: (A Hands-on Approach)”, Universities Press (INDIA) Private Limited 2014, 1st Edition.	

Reference Books	
1.	Michael Miller, “The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World”, kindle version.
2.	Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, Apress Publications 2013, 1st Edition,.
3.	Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" 4..CunoPfister, “Getting Started with the Internet of Things”, O Reilly Media 2011
Web Resources	
1.	https://www.simplilearn.com
2.	https://www.javatpoint.com
3.	https://www.w3schools.com

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	S	M	M	S	M
CO2	S	S	S	S	M	M	S	S	S	M
CO3	S	S	M	S	S	S	S	M	S	S
CO4	S	M	S	S	S	M	S	S	S	S
CO5	S	M	S	M	S	S	S	M	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	3	2	3	2
CO2	2	3	3	3	3	3
CO3	3	2	2	3	2	3
CO4	3	2	2	2	3	3
CO5	2	3	3	2	2	3
Weightage of course contributed to each PSO	12	12	13	12	13	14
Weighted % of Course Contribution to POs	2.4	2.4	2.6	2.4	2.6	2.8

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – III

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Natural Language Processing	Elective III	4	-	-		3	25	75	100
Learning Objectives										
LO1	To understand approaches to syntax and semantics in NLP.									
LO2	To learn natural language processing and to learn how to apply basic algorithms in this field.									
LO3	To understand approaches to discourse, generation, dialogue and summarization within NLP.									
LO4	To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc.									
LO5	To understand current methods for statistical approaches to machine translation.									
UNIT	Contents								No. of Hours	
I	Introduction : Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue- Applications – The role of machine learning – Probability Basics –Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.								12	
II	Word level and Syntactic Analysis: Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis : Context-free Grammar-Constituency- Parsing- Probabilistic Parsing.								12	

III	Semantic analysis and Discourse Processing: Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing : cohesion-Reference Resolution-Discourse Coherence and Structure.	12
IV	Natural Language Generation: Architecture of NLG Systems-Generation Tasks and Representations- Application of NLG. Machine Translation : Problems in Machine Translation. Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.	12
V	Information retrieval and lexical resources: Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: WorldNet-Frame Net Stemmers- POS Tagger- Research Corpora SSAS.	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Describe the fundamental concepts and techniques of natural language processing. Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Distinguish among the various techniques, taking into account the assumptions Strengths and weaknesses of each. Use NLP technologies to explore and gain a broad understanding of text data.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions. Use NLP methods to analyses sentiment of a text document.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Analyze large volume text data generated from a range of real-world applications. Use NLP methods to perform topic modelling.	PO1, PO2, PO3, PO4, PO5, PO6

CO5	Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness. Determine the framework in which artificial intelligence and the Internet of things may function, including interactions with people, enterprise functions, and environments.	PO1, PO2, PO3, PO4, PO5, PO6
Text Books		
1.	Daniel Jurafsky, James H. Martin, “Speech & language processing”, Pearson publications.	
2.	Allen, James. Natural language understanding. Pearson, 1995.	
Reference Books		
1.	Pierre M. Nugues, “An Introduction to Language Processing with Perl and Prolog”, Springer	
Web Resources		
1.	https://en.wikipedia.org/wiki/Natural_language_processing	
2.	https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	M	L	S	S
CO2	S	S	S	M	S	S	S	S	M	S
CO3	M	S	S	S	S	M	S	M	S	M
CO4	S	S	S	S	S	M	L	S	S	S
CO5	S	S	M	S	S	S	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	2
CO2	2	3	3	3	2	3
CO3	2	3	3	3	2	3
CO4	3	2	2	3	2	3
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	13	14	14	15	12	14
Weighted % of Course Contribution to POs	2.6	2.8	2.8	3	2.4	2.8

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – III

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Enterprise Resource Planning	Skill Enha. Course (SEC) IV	1	-	-	-	2	25	75	100
Learning Objectives										
LO1	To understand the basic concepts, Evolution and Benefits of ERP.									
LO2	To know the need and Role of ERP in logical and Physical Integration.									
LO3	Identify the important business functions provided by typical business software such as enterprise resource planning and customer relationship management									
LO4	To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth									
LO5	To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills									
UNIT	Contents								No. of Hours	
I	ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP, Components and needs of ERP, ERP Vendors; Benefits & Limitations of ERP Packages.								6	
II	Need to focus on Enterprise Integration/ERP; Information mapping; Role of common shared Enterprise database; System Integration, Logical vs. Physical System Integration, Benefits & limitations of System Integration, ERP's Role in Logical and Physical Integration. Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.								6	
III	ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction,								6	

	Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications. Cloud and Open Source, Quality Management, Material Management, Financial Module, CRM and Case Study.	
IV	ERP Implementation Basics, , ERP implementation Strategy, ERP Implementation Life Cycle ,Pre- Implementation task, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.	6
V	ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study.	6
TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the basic concepts of ERP.	PO1, PO2, PO6
CO2	Identify different technologies used in ERP	PO2, PO3, PO4
CO3	Understand and apply the concepts of ERP Manufacturing Perspective and ERP Modules	PO1, PO3, PO6
CO4	Discuss the benefits of ERP	PO2, PO6
CO5	Apply different tools used in ERP	PO1, PO3, PO5
Text Books		
1.	Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill.	
Reference Books		
1.	Enterprise Resource Planning – Diversified by Alexis Leon, TMH.	
2.	Enterprise Resource Planning – Ravi Shankar & S. Jaiswal , Galgotia	
Web Resources		
1.	https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm	

2.	https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource-planning/
3.	https://www.guru99.com/erp-full-form.html
4.	https://www.oracle.com/in/erp/what-is-erp/

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	M	S	S	S	S	M
CO2	S	S	S	S	S	M	S	S	S	S
CO3	S	S	S	M	S	S	S	M	S	S
CO4	S	M	S	S	S	M	M	S	S	M
CO5	M	S	M	S	S	S	S	M	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	3	3	3	2
CO2	3	2	2	2	2	2
CO3	2	3	2	2	3	3
CO4	2	2	3	2	2	3
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	12	13	12	12	13	12
Weighted % of Course Contribution to POs	2.4	2.6	2.4	2.4	2.6	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – III

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Problem Solving Techniques	Skill Enha. Course (SEC) V	2	-	-	-	2	25	75	100
Learning Objectives										
LO1	Understand the systematic approach to problem solving.									
LO2	Know the approach and algorithms to solve specific fundamental problems.									
LO3	Understand the efficient approach to solve specific factoring-related problems.									
LO4	Understand the efficient array-related techniques to solve specific problems.									
LO5	Understand the efficient methods to solve specific problems related to text processing. Understand how recursion works.									
UNIT	Contents								No. of Hours	
I	Introduction: Notion of algorithms and programs – Requirements for solving problems by computer – The problem-solving aspect: Problem definition phase, Getting started on a problem, The use of specific examples, Similarities among problems, Working backwards from the solution–General problem-solving strategies- Problem solving using top-down design–Implementation of algorithms–The concept of Recursion.								6	
II	Fundamental Algorithms: Exchanging the values of two variables – Counting – Summation of a set of numbers-Factorial computation-Sine function computation – Fibonacci Series generation – Reversing the digits of an integer –Base Conversion.								6	

III	Factoring Methods: Finding the square root of a number – The smallest divisor of an integer – Greatest common divisor of two integers – Generating prime numbers – Computing the prime factors of an integer – Generation of pseudo-random numbers –Raising a number to a large power– Computing the nth Fibonacci number.	6
IV	Array Techniques: Array order reversal – Array counting or histogramming – Finding the maximum number in a set – Removal of duplicates from an ordered array-Partitioning an array-Finding the k th smallest element– Longest monotone subsequence.	6
V	Text Processing and Pattern Searching: Text line length adjustment – Left and right justification of text – Keyword searching in text – Text line editing – Linear pattern search. Recursive algorithms: Towers of Hanoi–Permutation generation.	6
TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the logic of problem and analyses implementation of algorithm and Top Down approach And concept of Recursion	PO1, PO2, PO6
CO2	Able to understand the Sequence of Numbers and Series Fibonacci , Reversing ,Base Conversion.	PO2, PO3, PO4
CO3	Able to do Algebraic operations	PO1, PO3, PO6
CO4	Coverage of Arrays and its Logics	PO2, PO6
CO5	Text Processing and Pattern Searching Approach	PO1, PO3, PO5
Text Books		
1.	R.G.Dromey,HowtoSolveitbyComputer,PearsonIndia,2007	

Reference Books	
1.	George Polya, Jeremy Kilpatrick, The Stanford Mathematics Problem Book: With Hints and Solutions, Dover Publications, 2009 (Kindle Edition 2013).
2.	Greg W. Scruggs, Problem Solving with Computers, Jones & Bartlett 1st edition, 1996.
Web Resources	
1.	https://www.studytonight.com/
2.	https://www.w3schools.com/

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	M	M	M	S	M
CO2	M	S	S	S	M	M	S	S	S	M
CO3	S	S	S	S	S	S	S	S	S	M
CO4	S	S	S	S	M	M	S	M	S	M
CO5	M	M	S	S	S	M	M	M	S	M

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	3	2	2
CO2	2	2	3	2	3	2
CO3	3	2	3	3	3	3
CO4	2	2	3	3	3	3
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	12	12	13	14	14	12
Weighted % of Course Contribution to POs	2.4	2.4	2.6	2.8	2.8	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – IV

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Programming in Java	Core VII	5	-	-	-	5	25	75	100
Learning Objectives										
LO1	To provide fundamental knowledge of object-oriented programming									
LO2	To equip the student with programming knowledge in Core Java from the basics up.									
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.									
LO4	To provide fundamental knowledge of object-oriented programming.									
LO5	To equip the student with programming knowledge in Core Java from the basics up.									
UNIT	Contents								No. of Hours	
I	Introduction: Review of Object Oriented concepts – History of Java – Java buzzwords – JVM architecture – Data types - Variables - Scope and life time of variables - arrays - operators – control statements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data – Static Method String and String Buffer Classes.								15	
II	Inheritance: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. Packages: Definition- Access Protection –Importing Packages. Interfaces: Definition–Implementation–Extending Interfaces. Exception Handling: try – catch- throw - throws – finally – Built-in exceptions								15	

	- Creating own Exception classes.	
III	Multithreaded Programming: Thread Class - Runnable interface – Synchronization–Using synchronized methods– Using synchronized statement- Inter thread Communication –Deadlock. I/O Streams: Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.	15
IV	AWT Controls: The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers. Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes.	15
V	Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton – Jtoggle Button – Jcheck Box – Jradio Button - JLabel, JtextField - JTextArea - JList - JComboBox - JScrollPane.	15
TOTAL HOURS		75
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PO1, PO2, PO6
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO2, PO3, PO8
CO3	Implement multi-threading and I/O Streams of Core Java	PO1, PO3, PO5
CO4	Implement AWT and Event handling.	PO2, PO6
CO5	Use Swing to create GUI.	PO1, PO3, PO6

Text Books	
1.	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010
2.	Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999
Reference Books	
1.	Head First Java, O ‘Rielly Publications,
2.	Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010
Web Resources	
1.	https://javabeginnerstutorial.com/core-java-tutorial
2.	http://docs.oracle.com/javase/tutorial/
3.	https://www.coursera.org/

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	M	S	S	S
CO2	S	M	S	M	S	S	S	M	S	M
CO3	S	S	S	S	M	S	S	S	S	S
CO4	M	S	S	S	S	M	S	S	S	M
CO5	S	S	M	S	S	M	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	3	2
CO2	3	2	2	3	2	3
CO3	2	3	3	3	3	2
CO4	2	2	2	3	2	3
CO5	2	3	3	2	2	2
Weightage of course contributed to each PSO	12	12	13	13	12	12
Weighted % of Course Contribution to POs	2.4	2.4	2.6	2.6	2.4	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – IV

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Programming in Java Lab	Core VIII	-	-	5	-	5	40	60	100
Learning Objectives										
LO1	To provide fundamental knowledge of object-oriented programming.									
LO2	To equip the student with programming knowledge in Core Java from the basics up.									
LO3	To enable the students to know about Event Handling.									
LO4	To enable the students to use String Concepts.									
LO5	To equip the student with programming knowledge in to create GUI using AWT controls.									
S.NO	LAB EXERCISES								No. of Hours	
1.	Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer									
2.	Write a Java program to multiply two given matrices.									
3.	Write a Java program that displays the number of characters, lines and words in a text									
4.	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.									
5.	Write a program to do String Manipulation using Character Array and perform the following string operations:									

	<ul style="list-style-type: none"> a. String length b. Finding a character at a particular position c. Concatenating two strings 	60
6.	<p>Write a program to perform the following string operations using String class:</p> <ul style="list-style-type: none"> a. String Concatenation b. Search a substring c. To extract substring from given string 	
7.	<p>Write a program to perform string operations using String Buffer class:</p> <ul style="list-style-type: none"> a. Length of a string b. Reverse a string c. Delete a substring from the given string 	
8.	<p>Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.</p>	
9.	<p>Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.</p>	
10.	<p>Write a program to demonstrate the use of following exceptions.</p> <ul style="list-style-type: none"> a. Arithmetic Exception b. Number Format Exception c. Array Index Out of Bound Exception d. Negative Array Size Exception 	
11.	<p>Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether</p>	

	the file is writable, the type of file and the length of the file in bytes	
12.	Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.	
13.	Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).	
14.	Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.	
15.	Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “stop” or “ready” or “go” should appear above the buttons in a selected color. Initially there is no message shown.	
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PO1
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO1, PO2
CO3	Implement multi-threading and I/O Streams of Core Java	PO4, PO6
CO4	Implement AWT and Event handling.	PO4, PO5, PO6
CO5	Use Swing to create GUI.	PO3, PO6
Text Books		
1.	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.	

2.	Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.
Reference Books	
1.	Head First Java, O’Rielly Publications,
2.	Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.
Web Resources	
1.	https://www.w3schools.com/java/
2.	http://java.sun.com
3.	http://www.afu.com/javafaq.html

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	S	M	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	M	M	M
CO4	S	S	M	S	M	S	S	S	S	S
CO5	M	S	S	S	S	M	S	S	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	3	2	3
CO2	3	3	3	3	3	3
CO3	3	2	2	3	2	3
CO4	3	3	3	3	3	3
CO5	3	2	3	3	2	3
Weightage of course contributed to each PSO	15	12	14	15	12	15
Weighted % of Course Contribution to POs	3	2.4	2.8	3	2.4	3

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – IV

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Resource Management Techniques	Elective IV	3	-	-		3	25	75	100
Learning Objectives										
LO1	To introduce the concepts of OR									
LO2	To explain the Linear Programming Problem									
LO3	To illustrate the Simplex Method									
LO4	To know the Duality Theorems									
LO5	To understanding the Methods for finding IBFS for the Transportation Problems									
UNIT	Contents								No. of Hours	
I	Development of OR: Definition of OR – Modeling – Characteristics and Phases - Tools, Techniques & Methods - scope of OR.								12	
II	Linear Programming Problem: Formulation - Slack & surplus Variables - Graphical solution of LPP.								12	
III	Simplex Method: Computational Procedure - Big-M method - Concept of duality in LPP - Definition of primal dual problems - General rules for converting any primal into its dual.								12	
IV	Duality Theorems: (without proof) Primal dual correspondence - Duality and Simplex method- Mathematical formulation of assignment problem - Method for solving assignment problem.								12	
V	Mathematical formulation of Transportation Problem: Methods for								12	

	Finding IBFS for the Transportation Problems.	
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	To understanding the concepts of Development of OR	PO1,PO2, PO3,PO4, PO5, PO6
CO2	Develop linear programming (LP) models for shortest path, maximum flow, minimal spanning tree, critical path, minimum cost flow, and transshipment problems	PO1,PO2, PO3,PO4, PO5, PO6
CO3	Solve the problems of Simplex Method	PO1,PO2, PO3, PO4, PO5, PO6
CO4	To study the Duality Theorems	PO1,PO2, PO3,PO4, PO5, PO6
CO5	Finding initial basic feasible and optimal solution of the Transportation problems	PO1,PO2, PO3,PO4, PO5, PO6
Text Books		
1.	Operations Research, S.D.Sharma, KedarNath Ram Nath& Co Unit I : Chapter-1(1.1, 1.2, 1.4,1.,1.8,1.9,1.10,1.11) Unit II : Chapter-3 (3.1, 3.2, 3.3, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.4,3.5) Unit III : Chapter-5 (5.1, 5.2, 5.2.1, 5.3,5.4,5.5.4) Chapter- 7 (7.1,7.2,7.3,7.4) Unit IV : Chapter-7 (7.5) (Statements only); 7.6, 7.7 Chapter 11(11.2,11.3,11.4) Unit V : Chapter-12 (12.2 to 12.8)	
Reference Books		
1.	Operation Research, Nita H.Shah, Ravi M.Gor and Hardiksoni, PrenticeHall of India Pvt. Ltd., New Delhi 2008.	
2.	Operation Research, R.Sivarethinamohan, Tata McGraw Hill, 2005.	

3.	Operations Research – An Introduction by Hamdy A. Taha. Ninth Edition, Dorling Kindersley Pvt. Ltd., Noida, India, 2012
Web Resources	
1.	Web resources from NDL Library, E-content from open-source libraries

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	S	M	M	S	S
CO2	S	S	S	S	S	M	S	M	S	M
CO3	M	S	S	S	S	S	S	M	M	S
CO4	S	M	S	S	S	M	S	M	S	M
CO5	S	M	M	S	S	M	S	M	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	3	2	2
CO2	3	3	2	3	3	3
CO3	3	3	3	3	3	2
CO4	3	2	3	2	2	3
CO5	3	3	2	3	3	3
Weightage of course contributed to each PSO	15	14	13	14	13	13
Weighted % of Course Contribution to POs	3	2.8	2.6	2.8	2.6	2.6

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – IV

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Numerical Methods	Elective IV	3	-	-		3	25	75	100
Learning Objectives										
LO1	To introduce the various topics in Numerical methods.									
LO2	To make understand the fundamentals of algebraic equations.									
LO3	To apply interpolation and approximation on examples.									
LO4	To solve problems using numerical differentiation and integration									
LO5	To solve linear systems, numerical solution of ordinary differential equations.									
UNIT	Contents								No. of Hours	
I	FUNDAMENTALS OF ALGEBRAIC EQUATION: Solution of algebraic and transcendental equations-Bisection method – Fixed point iteration method – Newton Raphson method –linear system of equations – Gauss elimination method – Gauss Jordan method .								12	
II	ITERATIVE, INTERPOLATION AND APPROXIMATION: Iterative methods - Gauss Jacobi and Gauss Seidel –Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices. Interpolation with unequal intervals –Lagrange's interpolation – Newton's divided difference interpolation								12	
III	INTERPOLATION WITH EQUAL INTERVAL: Difference operators and relations. -Interpolation with equal intervals – Newton's forward and backward difference formulae.								12	

IV	NUMERICAL DIFFERENTIATION AND INTEGRATION: Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson’s 1/3 rule	12
V	INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS: Single step methods – Taylor’s series method – Euler’s method – Modified Euler’s method – Runge Kutta method for solving(first, second , Third and 4th) order equations – Multi step methods	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Know how to solve various problems on numerical methods	PO1,PO2, PO3,PO4, PO5, PO6
CO2	Use approximation to solve problems	PO1,PO2, PO3,PO4, PO5, PO6
CO3	Differentiation and integration concept are applied	PO1,PO2, PO3, PO4, PO5, PO6
CO4	Apply , direct methods for solving linear systems	PO1,PO2, PO3,PO4, PO5, PO6
CO5	Numerical solution of ordinary differential equations	PO1,PO2, PO3,PO4, PO5, PO6
Text Books		
1.	Numerical Methods, Second Edition, S. Arumugam, A. ThangapandiIssac, A. Somasundaram, SCITECH publications, 2009.	
Reference Books		
1.	Mathews J.H. Numerical Method for Maths, Science and Engineering; PHI, New Delhi, 2001	
2.	Iqbal H. Khan & Q. Hassan Numerical Methods for Engineers and Scientist - Galgotia Publications (P) Ltd., New Delhi – 1997	

3.	M.K. Jain, S.R.K. Iyengar & R.K.Jain - Numerical Methods for Scientific and Engineering Computation - New Age International (P) Ltd., New Delhi – 1996.
Web Resources	
1.	Web resources from NDL Library, E-content from open-source libraries.

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	M	S	S	S
CO2	M	S	S	S	M	M	S	M	S	M
CO3	S	S	M	S	S	M	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	M	S	S	M	M	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	3	2	2
CO2	3	3	2	3	3	3
CO3	3	3	3	3	3	2
CO4	3	2	3	2	2	3
CO5	3	3	2	3	3	3
Weightage of course contributed to each PSO	15	14	13	14	13	13
Weighted % of Course Contribution to POs	3	2.8	2.6	2.8	2.6	2.6

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – IV

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Open Source Technologies	Skill Enha. Course (SEC) VI	2	-	-	-	2	25	75	100
Learning Objectives										
LO1	Able to Acquire and understand the basic concepts in Java, application of OOPS concepts.									
LO2	Acquire knowledge about operators and decision-making statements.									
LO3	To Identify the significance and application of Classes, arrays and interfaces and Analyzing java arrays									
LO4	Understand about the applications of OOPS concepts and analyze overriding and Packages through java programs.									
LO5	Can Create window-based programming using applet and graphics programming.									
UNIT	Contents								No.of Hours	
I	Open Source–open source :Commercial software–What is Linux –Free Software–Where I can use Linux-Linux kernel–Linux distributions.								6	
II	Introduction Linux Essential Commands: –File System concept –Standard Files –The Linux Security Model – Introduction to Unix – UnixComponentsUnixFiles–FileAttributesandPermission–StandardI/O–Redirection– Pipes and Filters–Grep and Stream Editor								6	
III	Introduction - Apache Explained :- Starting, Stopping and Restarting Apache –Modifying the Default configuration – Securing Apache – Set user and Group								6	
IV	MySQL: Introduction to MySQL: – The show databases and table – The USE command –Create Database and Tables – Describe Table–Select, Insert, Update and Delete statement database.								6	

V	Introduction –PHP Form processing: – Database Access with PHP– MySQL, MySQL Functions–Inserting Records–Selecting Records–Deleting Records–Update Records.	6
TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Acquire and understand the basic concepts in Java,application of OOPS concepts.	PO1,PO3, PO6,PO8
CO2	Acquire knowledge about operators and decision-making statements.	PO1,PO2, PO3,PO6
CO3	Identify the significance and application of Classes, arrays and interfaces and analyzing java arrays	PO3,PO5
CO4	Understand about the applications of OOPS concepts and analyze overriding and packages through java programs.	PO1,PO2, PO3,PO7
CO5	Create window-based programming using applet and Graphics programming.	PO2, PO6, PO7
Text Books		
1.	James Lee and Brent Ware–Open Source Web Development with LAMP using	
	LINUX, Apache, MySQL, Perl and PHP, Dorling Kindersley(India) Pvt .Ltd, 2008.	
Reference Books		
1.	Eric Rosebrock, Eric Filson, –Setting up LAMP: Getting Linux, Apache, MySQL and PHP and Working together, John Wiley and Sons, 2004.	
2.	Anthony Butcher, –Teach Yourself MySQL in 21 days, 2nd Edition, Sams Publication.	
3.	Rich Bower, Daniel Lopez Ridrejo, Alian Liska, –Apache Administrator’s Handbook, Sams Publication.	
4.	Tammy Fox, –Red Hat Enterprise Linux 5 Administration Unleashed, Sams Publication.	

5.	.Naramore Eligabette, Gerner Jason, Wrox Press, Wiley Dreamtech Press, -Beginning PHP5,Apache,MySQLWeb Developmentl,2005.
Web Resources	
1.	Introduction to Open-Source and its benefits-Geeks for Geeks
2.	https://www.bing.com/

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	S	M	M	S	M
CO2	M	S	M	S	S	M	S	M	S	M
CO3	S	M	S	S	M	M	S	M	M	S
CO4	S	S	M	S	S	M	S	M	S	M
CO5	S	M	S	S	S	M	S	M	M	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	2	2
CO2	3	2	3	2	3	3
CO3	3	2	2	2	2	3
CO4	2	3	3	3	3	2
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	13	13	13	12	13	12
Weighted % of Course Contribution to POs	2.6	2.6	2.6	2.4	2.6	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – IV

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Biometrics	Skill Enha. Course (SEC) VII	2	-	-	-	2	25	75	100
Learning Objectives										
LO1	Identify the various biometric technologies.									
LO2	Design of biometric recognition.									
LO3	Develop simple applications for privacy									
LO4	Understand the need of biometric in the society									
LO5	Understand the scope of biometric techniques									
UNIT	Contents								No. of Hours	
I	Introduction: What is Biometrics, History, Types of biometric Traits, General architecture of biometric systems, Basic working of biometric matching, Biometric system error and performance measures, Design of biometric system, Applications of biometrics, Biometrics versus traditional authentication methods. Face Biometrics: Introduction, Background of Face Recognition, Design of Face Recognition System, Neural Network for Face Recognition, Face Detection in Video Sequences, Challenges in Face Biometrics, .7 Face Recognition Methods, Advantages and Disadvantages.								6	
II	Retina and Iris Biometrics: Introduction, Performance of Biometrics, Design of Retina Biometrics, Design of Iris Recognition System, Iris Segmentation Method , Determination of Iris Region, Determination of Iris Region,								6	

	Applications of Iris Biometrics, Advantages and Disadvantages Vein and Fingerprint Biometrics: Introduction, Biometrics Using Vein Pattern of Palm, Fingerprint Biometrics, Fingerprint Recognition System, Minutiae Extraction, Fingerprint Indexing, Experimental Results, Advantages and Disadvantages.	
III	Privacy Enhancement Using Biometrics: Introduction, Privacy Concerns Associated with Biometric Deployments, Identity and Privacy, Privacy Concerns, Biometrics with Privacy Enhancement, Comparison of Various Biometrics in Terms of Privacy, Soft Biometrics.	6
IV	Watermarking Techniques: Introduction, Data Hiding Methods, Basic Framework of Watermarking, Classification of Watermarking, Applications of Watermarking, Attacks on Watermarks, Performance Evaluation, Characteristics of Watermarks, General Watermarking Process, Image Watermarking Techniques.	6
V	Biometric Standards: Introduction, Standard Development Organizations, Application Programming Interface (API), Information Security and Biometric Standards, Biometric Template Interoperability.	6
TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	To understand the basic concepts and the functionality of the Biometrics, Face Biometrics, Types, Architecture and Applications.	PO1,PO3, PO6,PO8
CO2	To know the concepts Retina and Iris Biometrics and Vein and Fingerprint Biometrics.	PO1,PO2, PO3,PO6
CO3	To analyses the Privacy Enhancement and Multimodal Biometrics.	PO3,PO5
CO4	To get analytical idea on Watermarking Techniques	PO1,PO2, PO3,PO7
CO5	To Gain knowledge on Future scope of Biometrics, and Study of various Biometric Techniques.	PO2, PO6, PO7
Text Books		

1.	Biometrics: Concepts and Applications by G.R Sinha and Sandeep B.Patil , Wiley, 2013
Reference Books	
1.	Guide to Biometrics by Ruud M. Bolle, Sharath Pankanti, Nalinik. Ratha, Andrew W.Senior, Jonathan H. Connell , Springer 2009
2.	Introduction to Biometrics by Anil k. Jain, Arun A. Ross, Karthik Nandakumar
3.	Hand book of Biometrics by Anil K. Jain, Patrick Flynn, Arun A.Ross.
Web Resources	
1.	https://www.tutorialspoint.com/biometrics/index.htm
2.	https://www.javatpoint.com/biometrics-tutorial
3.	https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	S	S	S
CO2	S	S	S	S	S	M	S	M	S	M
CO3	S	M	S	M	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	M	M
CO5	M	S	M	S	S	M	S	M	S	M

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	2	2
CO2	3	2	3	2	3	3
CO3	3	2	2	2	2	3
CO4	3	2	3	3	3	2
CO5	3	3	3	3	2	2
Weightage of course contributed to each PSO	13	12	13	12	12	12
Weighted % of Course Contribution to POs	2.6	2.4	2.6	2.4	2.4	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER - IV

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Environmental Studies	Supportive	1	-	-	-	2	25	75	100
Learning Objectives										
LO1	Demonstrate an integrative approach to environmental issues with a focus on sustainability;									
LO2	Use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving;									
LO3	Communicate complex environmental information to both technical and non-technical audiences									
LO4	Understand and evaluate the global scale of environmental problems and									
LO5	Reflect critically on their roles, responsibilities, and identities as citizens, consumers and environmental actors in a complex, interconnected world.									
UNIT	Contents									
I	Unit – I: The Environment: The Atmosphere, Hydrosphere, Lithosphere, Biosphere, Ecosystem, Biogeochemical Cycle (Carbon Cycle, Nitrogen Cycle),									
II	Unit – II: Environment Pollution: Air Pollution, Water Pollution, Soil Pollution, Radiation Pollution.									
III	Unit – III: Population Ecology: Individuals, Species, Pollution, Community, Control Methods of Population, Urbanization and its effects on Society, Communicable Diseases and its Transmission, Non-Communicable Diseases.									
IV	Unit- IV: Environmental Movements in India: Grassroot Environmental movements in India, Role of women, Environmental Movements in Tamil Nadu, State Pollution Control Board, Central Pollution Control Board.									

V	Unit –V Natural Resources: Conservation of Natural Resources, Management and Conservation of Wildlife, Soil Erosion and Conservation, Environmental Laws: Water Act, 1974, Air Act, 1981, The Wildlife (Protection) Act, 1972, Environment Protection, 1986, Natural Disasters and their Management.
Text Books	
1.	Dr Bharucha Erach, Text Book of Environmental Studies for UG Course, University Press (India) Pvt. Ltd.
2.	Dr Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad – 380 013, India.
3.	Katyal Timi & Satake M., Environmental Pollution, Anmol Publication Pvt. Ltd, New Delhi.
4.	G. R. Chhatwal, M. C. Mehra, M. Satake, T. Katyal & Mohan V., Environmental Radiation and Thermal Pollution and their control, Anmol Publications, New Delhi.
5.	R. C. Brunner, Hazardous Waste Incineration, Mc Graw Hill Inc.
6.	K. C. Agarwal, Environmental Biology, Nidi Publishing Ltd, Bikaner.
7.	Dr Bharucha Erach, Text Book of Environmental Studies for UG Course, University Press (India) Pvt. Ltd.
8.	Walstra, P. Wouters, J.T.M. and Geurts, T.J. 2006. Dairy Science and Technology. CRC Press, New York.
9.	Baradach, JE. Ryther. JH. and, MC larney WO., 1972. Aquaculture. The farming and Husbandry of Freshwater and Marine Organisms. Wiley Inter Science, New York.

SEMESTER – V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Operating Systems	Core IX	5	-	-	-	4	25	75	100
Learning Objectives										
LO1	Understanding the design of the Operating System									
LO2	Imparting knowledge on CPU scheduling, Process and Memory Management.									
LO3	To code specialized programs for managing over all resources and operations of the computer.									
LO4	To study about the concept of Job and processor scheduling									
LO5	To learn about the concept of memory organization and multiprogramming									
UNIT	Contents								No. of Hours	
I	Introduction: operating system, history (1990sto2000andbeyond), distributed computing, parallel computation. Process concepts: definition of process ,process states-Life cycle of a process, process management-process state transitions, process control block(PCB), process operations , suspend and resume, context switching, Interrupts-Interrupt processing, interrupt classes, Inter process communication-signals, message passing.								15	
II	Asynchronous concurrent processes : mutual exclusion- critical section, mutual exclusion primitives, implementing mutual exclusion primitives, Peterson's algorithm, software solutions to the mutual Exclusion Problem-,n-thread mutual exclusion- Lamports Bakery Algorithm .Semaphores–Mutual exclusion with Semaphores, thread								15	

	synchronization with semaphores, counting semaphores, implementing semaphores. Concurrent programming: monitors ,message passing	
III	Deadlock and indefinite postponement: Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and Dijkstra's Banker's algorithm, deadlock detection, deadlock recovery.	15
IV	Job and processor scheduling : scheduling levels ,scheduling objectives, scheduling criteria, preemptive vs non-preemptive scheduling, interval timer or interrupting clock, priorities, scheduling algorithms-FIFO scheduling, RR scheduling, quantum size, SJF scheduling, SRT scheduling, HRN scheduling, multilevel feedback queues, Fair share scheduling	15
V	Real Memory organization and Management: Memory organization, Memory management, Memory hierarchy, Memory management strategies, contiguous vs non-contiguous memory allocation, single user contiguous memory allocation, fixed partition multiprogramming, variable partition multiprogramming, Memory swapping Virtual Memory organization: virtual memory basic concepts, multi level storage organization, block mapping, paging basic concepts, segmentation, paging/segmentation systems. Virtual Memory Management : Demand Paging ,Page replacement strategies	15
TOTAL HOURS		75
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Define the fundamentals of OS and identify the concepts relevant to process, process lifecycle, Scheduling Algorithms, Deadlock and	PO1

	Memory management	
CO2	Know the critical analysis of process involving various algorithms, an exposure to threads and semaphores	PO1,PO2
CO3	Have a complete study about Deadlock and its impact over OS. Knowledge of handling Deadlock with respective algorithms and measures to retrieve from deadlock..	PO4,PO6
CO4	Have complete knowledge of Scheduling Algorithms and its types.	PO4,PO5,PO6
CO5	Understand memory organization and management	PO3,PO8
Text Books		
1.	H.M.Deitel,OperatingSystems,ThirdEdition,PearsonEducationAsia,2011	
Reference Books		
1.	A.Silberschatz, and P.B. Galvin., Operating Systems Concepts, Nineth Edition, JohnWiley&Sons(ASIA)PteLtd.,2012	
2.	William Stallings, Operating System: Internals and Design Principles, Seventh Edition, Prentice-HallofIndia,2012.	
Web Resources		
1.	https://www.tutorialspoint.com/operating system/index.htm	
2.	https://www.javatpoint.com/operating system-tutorial	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	S	M	L	S	M
CO2	S	S	S	S	S	M	S	M	S	M
CO3	M	S	M	S	S	L	S	M	M	S
CO4	S	S	S	S	S	M	S	M	S	S
CO5	S	M	S	S	S	M	S	S	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	2	3	3
CO2	2	3	3	2	3	3
CO3	3	2	2	3	2	2
CO4	2	3	3	3	3	2
CO5	3	2	3	3	2	2
Weightage of course contributed to each PSO	12	12	12	13	13	12
Weighted % of Course Contribution to POs	2.4	2.4	2.4	2.6	2.6	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	ASP.Net Programming	Core X	5	-	-	-	4	25	75	100
Learning Objectives										
LO1	To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language.									
LO2	To develop ASP.NET Web application using standard controls.									
LO3	To implement file handling operations.									
LO4	To handles SQL Server Database using ADO.NET.									
LO5	Understand the Grid view control and XML classes.									
UNIT	Contents								No. of Hours	
I	Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements -Looping statements – Creating and using Objects – Arrays – String operations.								15	
II	Introduction to ASP.NET - IDE-Languages supported Components -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls -List Controls: Properties and its events.								15	
III	Rich Controls: Properties and its events – validation controls: Properties and its events– File Stream classes - File Modes – File Share – Reading and Writing to files –Creating, Moving, Copying and Deleting files – File uploading.								15	
IV	ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controls and its Properties – Data Binding								15	

V	Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating a Web application.	15
TOTAL HOURS		75
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Develop working knowledge of C# programming constructs and the .NET Framework	PO1, PO2, PO6
CO2	To develop a software to solve real-world problems using ASP.NET	PO2, PO3, PO5
CO3	To Work On Various Controls Files	PO1, PO3, PO6
CO4	To create a web application using MicrosoftADO.NET.	PO2, PO6
CO5	To develop web applications using XML	PO1, PO3, PO6
Text Books		
1.	Svetlin Nakov, Veselin Kolev & Co, Fundamentals of Computer Programming with C#, Faber publication,2019.	
2.	Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill, 2015.	
Reference Books		
1.	Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.	
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtechpres,2013.	
3.	Anne Boehm, Joel Murach, Murach’s C# 2015, Mike Murach& Associates Inc.2016.	
4.	Denielle Otey, Michael Otey, ADO.NET: The Complete reference, McGrawHill, 2008.	
5.	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, APRESS, 2010.	
Web Resources		
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/	

2.	https://www.javatpoint.com/net-framework
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Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	S	M	S	S	S
CO2	M	S	S	S	S	S	S	M	S	M
CO3	S	S	S	M	S	M	S	S	S	L
CO4	S	M	S	S	S	S	S	S	S	M
CO5	M	S	L	S	S	M	S	M	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	3	3
CO2	3	2	2	2	2	3
CO3	3	3	3	2	3	3
CO4	2	2	3	3	3	3
CO5	3	3	2	2	3	2
Weightage of course contributed to each PSO	15	12	12	12	14	14
Weighted % of Course Contribution to POs	3	2.4	2.4	2.4	2.8	2.8

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Data analytics Using R Programming	Core XI	5	-	-	-	4	25	75	100
Learning Objectives										
LO1	To understand the problem solving approaches									
LO2	To learn the basic programming constructs in R Programming									
LO3	To learn the basic programming constructs in R Programming									
LO4	To use R Programming data structures-lists, tuples, and dictionaries.									
LO5	To do input/output with files in R Programming.									
UNIT	Contents								No. of Hours	
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating —The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications —Perception and Quantification of Value –Understanding Big Data Storage —A General Overview of High-Performance Architecture—HDFS— Map Reduce and YARN— Map Reduce Programming Model								12	
II	Control Structures And Vectors -Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors								12	

	Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations	
III	LISTS - Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements , Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations	12
IV	FACTORS AND TABLES - Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables, Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING	12
V	OBJECT- ORIENTED PROGRAMMING :SClasses, SGeneric Functions, Writing SClasses, Using Inheritance, SClasses, Writing SClasses, Implementing a Generic Function on an SClass, visualization, Simulation, code profiling, Statistical Analysis with R,data manipulation,	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Work with big data tools and its analysis techniques	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
CO4	Perform analytics on data streams.	PO4, PO5, PO6
CO5	Learn No SQL databases and management.	PO3, PO8

Text Books		
1.	Roger D.Peng, R Programming for Data Science–,2012	
2.	Norman Matloff , The Art of R Programming-A Tour of Statistical Software Design , 2011	
Reference Books		
1.	Garrett Grolemond, Hadley Wickham, Hands-On Programming with R:Write Your Own Functions and Simulations , 1 st Edition,2014	
2.	Venables,W.N.,andRipley, Sprogramming–,Springer,2000.	
Web Resources		
1.	https://www.simplilearn.com	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	M	M	M	S	M
CO2	S	S	M	S	S	M	S	M	S	M
CO3	M	S	S	S	M	M	S	M	M	M
CO4	S	M	S	S	S	M	S	S	S	M
CO5	S	M	S	S	S	S	S	M	M	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	2	3	3	2	3
CO 2	3	3	2	2	3	2
CO 3	2	2	3	2	2	3
CO 4	2	3	3	2	3	2
CO 5	2	2	2	3	3	2
Weightage of course contributed to each PSO	12	12	13	12	13	12
Weighted % of Course Contribution to POs	2.4	2.4	2.6	2.4	2.6	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	R Programming-LAB	Core XII	-	-	5	-	4	40	60	100
Learning Objectives										
LO1	To understand the problem solving approaches									
LO2	To learn the basic programming constructs in R Programming									
LO3	To practice various computing strategies for R Programming-based solution store a world problems									
LO4	To use R Programming data structures-lists, tuples, and dictionaries.									
LO5	To do input/output with files in R Programming.									
UNIT	Contents								No. of Hours	
1.	Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.								60	
2.	Program, to find the area of rectangle, square, circle and triangle by accepting suitable input Parameters from user.									
3.	Write a program to find list of even numbers from 1to n using R-Loops.									
4.	Create a function to print squares of numbers in sequence									
5.	Write a program to join columns and rows in a data frame using cbind() and rbind() in R.									
6.	Implement different String Manipulation functions in R.									
7.	Implement different data structures in R (Vectors, Lists, Data Frames)									
8.	Write a program to read acsv file and analyze the data in the file in R.									

9.	Create pie chart and bar chart using R.	
10.	Create a data set and do statistical analysis on the data using R	
11.	Program to find factorial of the given number using recursive function	
12.	Write a R program to count the number of even and odd numbers from array of N numbers.	
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Acquire programming skills in core R Programming	PO1,PO4, PO5,
CO2	Acquire Object-oriented programming skills in R Programming.	PO1, PO4, PO8,
CO3	Develop the skill of design in graphical-user interfaces(GUI)in R Programming	PO1, PO3, PO6
CO4	Acquire R Programming skills to move into Specific branches	PO3,PO4,
CO5		PO1 PO5, PO6
Text Books		
1.	Roger D.Peng, R Programming for Data Science–,2012	
2.	Norman Matloff , The Art of R Programming-A Tour of Statistical Software Design , 2011	
Reference Books		
1.	Garrett Grolemond, Hadley Wickham, Hands-On Programming with R:Write Your Own Functions and Simulations , 1 st Edition,2014	
2.	Venables,W.N.,andRipley, Sprogramming–,Springer,2000.	
Web Resources		
1.	https://www.simplilearn.com	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	M	S	M	M	M	S	S
CO2	S	S	M	S	S	M	S	M	S	S
CO3	S	S	M	S	S	M	S	M	M	M
CO4	S	M	S	S	S	M	S	M	S	M
CO5	S	S	S	S	S	M	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	2	3	3	3	3	2
CO3	2	3	3	3	2	3
CO4	3	3	3	3	3	2
CO5	2	3	3	3	3	2
Weightage of course contributed to each PSO	12	15	15	15	14	12
Weighted % of Course Contribution to POs	2.4	3	3	3	2.8	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Image Processing	Elective V	4	-	-	-	3	25	75	100
Learning Objectives										
LO1	To learn fundamentals of digital image processing.									
LO2	To learn about various 2D Image transformations									
LO3	To learn about various image enhancement processing methods and filters									
LO4	To learn about various classification of Image segmentation techniques									
LO5	To learn about various image compression techniques									
UNIT	Contents								No. of Hours	
I	Digital Image Fundamentals: Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis								12	
II	2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform -Singular Value Decomposition								12	
III	Image Enhancement: Spatial domain methods- Point processing- Intensity transformations - Histogram processing- Spatial filtering- smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter.								12	
IV	Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge								12	

	based segmentation - Classification of edges- Edge detection - Hough transform- Active contour.	
V	Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression -Transform based compression,	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the fundamental concepts of digital image processing.	PO1
CO2	Understand various 2D Image transformations	PO1, PO2
CO3	Understand image enhancement processing techniques and filters	PO4, PO6
CO4	Understand the classification of Image segmentation techniques	PO4, PO5, PO6
CO5	Understand various image compression techniques	PO3, PO5
Text Books		
1.	S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015	
2.	Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009	
Reference Books		
1.	1. Jain Anil K , Fundamentals of digital image processing: , PHI,1988	
2.	Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003	
3.	Pratt William K , Digital Image Processing: , John Wiley,4/e,2007	
Web Resources		
1.	https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf	
2.	http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.	

	%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf
3.	https://dl.acm.org/doi/10.5555/559707
4.	https://www.ijert.org/image-processing-using-web-2-0-2

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	M	S	S
CO2	M	S	S	M	S	S	S	M	S	M
CO3	S	S	S	S	S	M	S	S	S	S
CO4	S	M	S	S	M	M	S	M	S	M
CO5	S	S	S	S	S	S	S	S	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	3	2
CO2	3	2	3	2	3	3
CO3	3	3	2	2	2	2
CO4	3	3	3	3	3	3
CO5	3	2	3	3	3	3
Weightage of course contributed to each PSO	14	13	13	12	14	13
Weighted % of Course Contribution to POs	2.8	2.6	2.6	2.4	2.8	2.6

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Computational Intelligence	Elective V	4	-	-	-	3	25	75	100
Learning Objectives										
LO1	To identify and understand the basics of AI and its search.									
LO2	To study about the Fuzzy logic systems.									
LO3	Understand and apply the concepts of Neural Network and its functions.									
LO4	Understand the concepts of Artificial Neural Network									
LO5	To study about the Genetic Algorithm.									
UNIT	Contents								No. of Hours	
I	Introduction to AI: Problem formulation – AI Applications – Problems – State Space and Search –Production Systems–Breadth First and Depth First– Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.								12	
II	Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification –Fuzzy Clustering–fuzzy rule- based classifier.								12	
III	Neural Networks: What is Neural Network ,Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Back propagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance								12	

	theory and Self Organizing Map, Recent Applications	
IV	Artificial Neural Networks :Fundamental Concepts– Basic Models of Artificial Neural Networks – Important Terminologies of ANNs– McCulloch-Pitts Neuron–Linear Separability – Hebb Network	12
V	Genetic Algorithm: Introduction–Biological Background – Genetic Algorithm Vs Traditional Algorithm–Basic Terminologies in Genetic Algorithm–Simple GA–General Genetic Algorithm– Operators in Genetic Algorithm	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Describe the fundamentals of artificial intelligence concepts and searching techniques.	PO1
CO2	Develop the fuzzy logic sets and membership function and defuzzification techniques.	PO1, PO2
CO3	Understand the concepts of Neural Network and analyze and apply the learning techniques	PO4, PO6
CO4	Understand the artificial neural networks and its applications.	PO4, PO5, PO6
CO5	Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.	PO3, PO8
Text Books		
1.	S.N.Sivanandam and S.N.Deepa, –Principles of Soft Computing II, 2nd Edition, Wiley India Pvt.Ltd.	
2.	Stuart Russell and Peter Norvig, –Artificial Intelligence- A Modern Approach II, 2nd Edition, Pearson Education in Asia.	
3.	S.Rajasekaran, G.A.Vijayalakshmi, –Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications I, PHI.	
Reference Books		
1.	F.Martin, Mcneill, and Ellen Thro, –Fuzzy Logic: A Practical approach II, AP Professional,	

	2000.ChinTeng Lin,C.S. George Lee, Neuro-Fuzzy Systems ,PHI
2.	Chin TengLin , C.S.GeorgeLee, Neuro-FuzzySystems ,PHI.
Web Resources	
1.	https://www.javatpoint.com/artificial-intelligence-tutorial
2.	https://www.w3schools.com/ai/

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	M	M	S	M
CO2	M	S	S	S	S	M	S	M	S	M
CO3	S	S	S	S	S	M	S	M	S	S
CO4	S	M	S	S	S	M	S	M	S	S
CO5	M	S	M	S	S	S	S	M	S	M

***S-Strong-3; M-Medium-2; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	2	3	2	2	3	2
CO 2	3	2	3	2	3	3
CO 3	3	3	2	2	2	2
CO 4	2	3	3	3	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	13	14	13	12	14	13
Weighted % of Course Contribution to POs	2.6	2.8	2.6	2.4	2.8	2.6

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Artificial Intelligence	Elective VI	4	-	-	-	3	25	75	100
Learning Objectives										
LO1	To learn various concepts of AI Techniques.									
LO2	To learn various Search Algorithm in AI.									
LO3	To learn probabilistic reasoning and models in AI.									
LO4	To learn about Markov Decision Process.									
LO5	To learn various type of Reinforcement learning.									
UNIT	Contents								No. of Hours	
I	Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree								12	
II	Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search								12	
III	Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.								12	
IV	Markov Decision process: MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.								12	
V	Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning,								12	

	active reinforcement learning- Q learning	
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the various concepts of AI Techniques.	PO1
CO2	Understand various Search Algorithm in AI.	PO1, PO2
CO3	Understand probabilistic reasoning and models in AI.	PO4, PO6
CO4	Understand Markov Decision Process.	PO4, PO5, PO6
CO5	Understand various type of Reinforcement learning Techniques.	PO3, PO4
Text Books		
1.	Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” ,3rd Edition, Prentice Hall.	
2.	Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill	
Reference Books		
1.	Trivedi, M.C., “A Classical Approach to Artifical Intelligence”, Khanna Publishing House, Delhi.	
2.	SarojKaushik, “Artificial Intelligence”, Cengage Learning India, 2011	
3.	David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010	
Web Resources		
1.	https://github.com/dair-ai/ML-Course-Notes	
2.	https://web.cs.hacettepe.edu.tr/~erkut/ain311.f21/index.html	
3.	https://www.toolify.ai/ index.html	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	M	M	S	S	S
CO2	M	S	S	S	M	M	S	M	S	S
CO3	S	S	S	S	S	M	S	M	M	M
CO4	S	M	S	S	S	S	S	M	S	S
CO5	S	S	S	M	S	M	S	M	S	M

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	3	2
CO2	3	2	3	2	3	3
CO3	3	3	3	3	2	2
CO4	2	2	3	3	3	3
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	13	13	14	13	14	13
Weighted % of Course Contribution to POs	2.6	2.6	2.8	2.6	2.8	2.6

*S-Strong-3; M-Medium-2 ; L-Low-1;

SEMESTER – V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Information Security	Elective VI	4	-	-	-	3	25	75	100
Learning Objectives										
LO1	To know the objectives of information security									
LO2	Understand the importance and application of each of confidentiality, integrity, authentication and availability									
LO3	Understand various cryptographic algorithms									
LO4	Understand the basic categories of threats to computers and networks									
LO5	To study about the concepts of security in networks, web security									
UNIT	Contents								No. of Hours	
I	Introduction to Information Security: Security mindset, Computer Security Concepts(CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms								12	
II	The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense. Cryptography: Concepts and Techniques: Introduction, plaintext and cipher text, substitution techniques, transposition techniques, encryption and decryption								12	
III	Symmetric and Asymmetric Cryptographic Techniques: DES, AES ,RSA algorithms Authentication and Digital Signatures :Use of Cryptography for authentication, Secure Hash function, Key								12	

	management–Kerberos	
IV	Program Security: Non- malicious Program errors –Buffer overflow, incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels. File protection Mechanisms, User Authentication Designing Trusted O.S: Security polices, models of security, trusted O.S design, Assurance intrusted O.S .Implementation examples	12
V	Security in Networks: Threats in networks, Network Security Controls– Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honey pots, Traffic flow security. Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand network security threats, security Services ,and counter measures	PO1
CO2	Understand vulnerability analysis of network security	PO1,PO2
CO3	Acquire background on hash functions; authentication; firewalls; intrusion detection techniques	PO4,PO6
CO4	Gain hands-on experience with programming and simulation techniques for security protocols.	PO4,PO5,PO6
CO5	Apply methods for authentication, access control, Intrusion detection and prevention	PO3,PO8
Text Books		
1	Security in Computing, Fourth Edition, by CharlesP.Pfleeger,PearsonEducation	
2	Cryptography And Network Security Principles And Practice,Fourth or Fifth Edition,William Stallings ,Pearson	
Reference Books		

1.	Cryptography and Network Security :CK Shyamala, NHarini ,Dr TR Padmanabhan, Wiley India, 1st Edition
2.	Cryptography and Network Security: Forouzan Mukhopadhyay, McGraw Hill, 2 nd Edition
3.	Information Security, Principles and Practice: Mark Stamp, Wiley India
Web Resources	
1.	https://www.geeksforgeeks.org/what-is-information-security/
2.	https://www.tutorialspoint.com/

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	M	M	M	S	M
CO2	S	S	S	S	S	M	S	M	S	M
CO3	M	S	S	S	S	M	M	M	M	M
CO4	M	S	S	M	S	M	S	M	M	M
CO5	S	M	S	S	S	S	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	3	2
CO2	3	2	3	2	2	3
CO3	3	2	3	3	2	2
CO4	2	2	3	2	2	3
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	13	12	14	12	12	13
Weighted % of Course Contribution to POs	2.6	2.4	2.8	2.4	2.4	2.6

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER - V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Value Education	Supportive	2	-	-	-	2	25	75	100
Learning Objectives										
LO1	Build physical and mental strength of the learners									
LO2	Strengthen the emotional and spiritual aspects of the learners.									
LO3	Make the learners responsible and cooperative citizens									
LO4	Develop democratic way of thinking and inculcate spirit of national integration									
LO5	Develop the practice of paying respect for dignity of individual and diversity in society									
UNIT	Contents								No. of Hours	
I	Yoga and Physical Health <ol style="list-style-type: none"> Physical Structure – Three bodies – Five Limitations Simplified Physical Exercise – Hand Exercise – Leg Exercise-Breathing Exercise – Eye Exercise – Kapalapathi Maharasanas 1-2 - Massages – Acu – puncture – relaxation Yogasanas- padmasana - vajrasanas – chakrasanas (side) – Viruchasanas – Yogamuthra – Patchimothasanas – Ustrasanas – Vakkarasanas – Salabasanas 								16	
II	Art of Nurturing the life force and Mind <ol style="list-style-type: none"> Maintaining the youthfulness – Postponing the aging process Sex and spirituality – significance of sexual vital fluid - married life-chastity Ten stage of mind Mental frequency – Methods for concentration 								16	

III	Sublimation 1.1 Purpose and Philosophy of life 1.2 Introspection – Analysis of thought 1.3 Moralization of desires 1.4 Naturalization of Anger	16
IV	Human Resource Development 1.1 Eradication of worries 1.2 Benefits of Blessings 1.3 Greatness of Friendship 1.4 Individual peace and world peace	16
V	Law of Nature 1.1 Unified Force – Cause and Effect system 1.2 Purity of Thought and Deed and Genetic Centre 1.3 Love and Compassion 1.4 Cultural Education – Five fold Culture	16
UNIT	Contents	No. of Hours
I	யோகமும் உடல்நலமும் 1.1. உடலமைப்பு – 3 உடல்கள் - ஐந்தில் அளவுமுறை 1.2. எளியமுறை உடற்பயிற்சி – கைப்பயிற்சி – கால் பயிற்சி - மூச்சுப் பயிற்சி – கண் பயிற்சி உடற்பயிற்சி - கபாலபதி 1.3. மகராசம் 1-2 உடல் தேய்த்தில் - அக்குபிரஷர் பயிற்சி – உடல் தளர்த்தில் 1.4. யோகாசனங்கள் - பத்மானசம் - வஜ்ராசனம் - சக்கராசனம் (பக்கவாட்டில்) – விருச்சாசனம் - யோக முத்ரா – பச்சி மோத்தாசனம் - உஸ்ட்ராசனம் - வக்கராசனம் - சலபாசம்	16
II	உயிர்வளமும் - மனவளமும் 2.1 இளமை காத்தல் - முதுமையைத் தள்ளிப்போடுதல் 2.2 பாலுணர்வும் ஆன்மீகமும் - வித்தின் மகிமை- இல்லற வாழ்வு – கற்புநெறி 2.3 மனதின் பத்து படிநிலைகள் 2.4 மன அலைச்சுழல் - மன ஓர்மைக்கான பயிற்சிகள்	16

III	குணநலப்பேறு 3.1 வாழ்வின் நோக்கம் - வாழ்க்கைத் தத்துவம் 3.2 அகத்தாய்வு – எண்ணம் ஆராய்தல் 3.3 ஆசை சீரமைத்தல் 3.4 சினம் தவிர்த்தல்	16
IV	மனிதவள மேம்பாடு 4.1 கவலை ஒழித்தல் 4.2 வாழ்த்தும் பயனும் 4.3 நட்பு நலம் 4.4 தனி மனித அமைதி – உலக அமைதி	16
V	இயற்கை நியதி 5.1 ஒருங்கிணைப்பு ஆற்றல் - செயல்விளைவுத் தத்துவம் 5.2 மனத்தாய்மை , வினைத்தாய்மை – கருமையம் 5.3 அன்பும் கருணையும் 5.4 பண்பாட்டுக் கல்வி – ஐந்தொழுக்கப் பண்பாடு	16

SEMESTER – V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	INTERNSHIP / INDUSTRIAL TRAINING	Supportive	-	-	-	-	1		100	100
Learning Objectives										
LO1	To offer a hands-on-learning experience, that allows the learners to maximize the outcome and benefits of their theoretical knowledge through practical implementation.									
LO2	By adding technical skills, soft skills and professional experience to the learners' resume, they can enhance their chances of securing the job.									
LO3	To provide the learners an experience of the real corporate world and thus help them to understand the expectations and requirements of the industry									
LO4	To enable the learners build their network and professional relationships, which turns them into confident future professionals.									
LO5	To learn about Industrial Infrastructure.									
	Contents									
	Duration of the Training: <ul style="list-style-type: none"> * The learners of all the Under-Graduation Programmes are to undergo the Internship / Industrial Training during the summer vacation, after completion of the IV Semester examinations. The training period is 30 working days. * Evaluation: * After completion of the training, the evaluation of the performance of the learners will be done in the V semester. * Two credits will be awarded for the best performers. * Viva-voce examination will be conducted and the learners have to appear for the Viva-voce individually. * At the time of Viva-voce, the learners have to submit the given records to the examiner. 									

	<ul style="list-style-type: none"> • Work Diary, endorsed by the trainer • A complete report on the objectives, modules and outcomes. • A certificate, duly signed and issued by the trainer 	
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand about Software techniques.	PO1,PO2
CO2	Understand about Software project management skills, design and quality management	PO2, PO3
CO3	Analyze on Software Requirements and Specification	PO3, PO4
CO4	Analyze on Software Testing, Maintenance	PO4, PO5
CO5	Design and conduct various types and levels of software quality for a software project	PO5, PO6

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	M	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	M	S	S	S	S	M	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	2	3
CO2	3	2	2	2	2
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	13	14	13	14
Weighted % of Course Contribution to Pos	3	2.6	2.8	2.6	2.8

*S-Strong-3; M-Medium-2; L-Low-1

SEMESTER – VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Computer Networks	Core XIII	6	-	-	-	4	25	75	100
Learning Objectives										
LO1	To learn the basic concepts of Data communication and Computer network									
LO2	To learn about wireless Transmission									
LO3	To learn about networking and data link layer.									
LO4	To study about Network communication.									
LO5	To learn the concept of Transport layer									
UNIT	Contents								No. of Hours	
I	Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media								15	
II	Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.								15	
III	Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth.								15	
IV	Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.								15	
V	Transport Layer - Services - Connection Management - Addressing,								15	

	Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography	
TOTAL HOURS		75
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models	PO1
CO2	To gain knowledge on Telephone systems using wireless network	PO1, PO2
CO3	To understand the concept of MAC	PO4, PO6
CO4	To analyze the characteristics of Routing and Congestion control algorithms	PO4, PO5, PO6
CO5	To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS	PO3, PO4
Text Books		
1.	A. S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice-Hall of India, 2008.	
Reference Books		
1.	B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition, 2017	
2.	F. Halsall, “Data Communications, Computer Networks and Open Systems”, Pearson Education, 2008	
3.	D. Bertsekas and R. Gallager, “Data Networks”, 2nd Edition, PHI, 2008.	
4.	Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002	
Web Resources		
1.	https://en.wikipedia.org/wiki/Computer_network	
2.	https://citationsy.com/styles/computer-networks	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	S	M	S	S	M
CO2	S	M	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	M	S	M	S	S
CO4	S	S	S	S	S	S	S	S	S	M
CO5	M	S	S	M	M	M	S	M	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	3	3
CO2	3	2	2	3	2	3
CO3	3	3	3	3	2	2
CO4	3	2	3	2	3	2
CO5	3	3	2	2	3	3
Weightage of course contributed to each PSO	15	12	13	12	13	13
Weighted % of Course Contribution to POs	3	2.4	2.6	2.4	2.6	2.6

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	ASP.Net Programming LAB	Core XIV	-	-	6	-	4	40	60	100
Learning Objectives										
LO1	To develop ASP.NET Web application using standard controls.									
LO2	To create rich database applications usingADO.NET.									
LO3	To implement file handling operations.									
LO4	To implement XML classes.									
LO5	To utilize ASP.NET security features for authenticating the website									
UNIT	Contents								No. of Hours	
1.	Create an exposure of Web applications and tools								60	
2.	Implement the Html Controls									
3.	Implement the Server Controls									
4.	Web application using Web controls.									
5.	Web application using List controls.									
6.	Web Page design using Rich control. Validate user input using Validation controls. Working with File concepts.									
7.	Web application using Data Controls.									
8.	Data binding with Web controls									

9.	Data binding with Data Controls.	
10.	Database application to perform insert, update and delete operations.	
11.	Database application using Data Controls to perform insert, delete, edit, paging and sorting operation.	
12.	Implement the Xml classes.	
13.	Implement Authentication – Authorization.	
14.	Ticket reservation using ASP.NET controls.	
15.	Online examination using ASP.NET controls	
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	To create web applications and implement various controls	PO1,PO2, PO3,PO4, PO5, PO6
CO2	Create web pages in Rich control.	PO1,PO2, PO3,PO4, PO5, PO6
CO3	Develop knowledge about file handling operations	PO1,PO2, PO3, PO4, PO5, PO6
CO4	An ability to design XML classes	PO1,PO2, PO3,PO4, PO5, PO6
CO5	To develop a software to solve real-world problems using ASP.NET	PO1,PO2, PO3,PO4, PO5, PO6
Text Books		
1.	Svetlin Nakov, Veselin Kolev& Co, Fundamentals of Computer Programming with C#, Faber publication,2019.	
2.	Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill,2015.	

Reference Books	
1.	Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres,2013.
3.	Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach & Associates Inc.2016.
4.	DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGrawHill,2008.
5.	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, APRESS,2010.
Web Resources	
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/
2.	https://www.javatpoint.com/net-framework

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	M	M	M	S	M
CO2	M	S	S	S	M	S	S	M	S	S
CO3	S	M	S	M	S	M	S	S	S	S
CO4	S	S	S	M	S	S	S	M	S	M
CO5	S	M	S	S	S	M	S	S	S	S

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	2	3	3
CO2	3	2	3	2	2	2
CO3	3	3	2	2	3	2
CO4	3	2	3	2	3	3
CO5	3	2	2	2	3	2
Weightage of course contributed to each PSO	15	11	12	10	14	12
Weighted % of Course Contribution to POs	3	2.2	2.4	2	2.8	2.4

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Project with viva voce	Core XV	-	-	6	-	4	40	60	100
Learning Objectives										
LO1	To motivate the Students to work in emerging/latest technologies.									
LO2	To help the students to develop ability.									
LO3	To apply theoretical and practical tools/techniques									
LO4	To solve real life problems related to industry, academic institutions and research laboratories.									
LO5	To expect to do planning, analyzing, designing, coding, and implementing the project.									
UNIT	Contents								No. of Hours	
I	The project proposal should include the following: <ul style="list-style-type: none">TitleObjectivesDetails of modules and process logicLimitations of the projectTools/Platforms, Languages to be usedSample Coding and ScreenshotsConclusion								60	
TOTAL HOURS								60		
Course Outcomes								Programme Outcomes		

CO	On completion of this course, students will	
CO1	Understand the problem.	PO1
CO2	Implement & execute the real time application.	PO1, PO2
CO3	Apply& execute the real time application.	PO4, PO6
CO4	Analyze various testing methods.	PO4, PO5, PO6
CO5	Verify the expected results in real time applications.	PO3, PO4
Reference Books		
1.	Lohit Mitra’ “Mastering Dot net Console, Windows, ASP.net” – Rudra Publications	
2.	Dr. K. Sathis kumar, Dr. Shri Vindhya, Dr. N. Venkatadri, “.Net Technology with C# Programming”	
3.	Ashutosh Bhatt Kamlesh K. Padaliya, “C# Programming with .Net Framework” –Bharthi Publications.	
Web Resources		
1.	https://www.edx.org/learn/project-based-learning	
2.	http://en.m.wikipedis.org/wiki/visual_basic_.net	
3.	http://stackoverflow.com/questions/436605/vb-net-how-to-reference-vv-net-module	
4.	http://www.codeproject.com/articles/14003/building-websites-with-vb-net	
5.	http://code .visual studio.com/docs	
6.	http://docs.microsoft.com/en-us-visual studio/ide/solutions-and-projects-in-visual-studio	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	M	S	S	M
CO2	S	S	S	M	S	S	S	M	S	S
CO3	S	M	S	S	M	M	S	S	S	M
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	M	M	S	M	S	S	S	M

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	3	2	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	2	3
CO4	3	3	2	3	3	2
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	14	15	13	14
Weighted % of Course Contribution to POs	3	2.8	2.8	3	2.6	2.8

*S-Strong-3; M-Medium-2 ; L-Low-1;

SEMESTER – VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Cryptography	Elective VII	-	5	-	-	3	25	75	100
Learning Objectives										
LO1	To understand the fundamentals of Cryptography									
LO2	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.									
LO3	To understand the various key distribution and management schemes.									
LO4	To understand how to deploy encryption techniques to secure data in transit across data networks									
LO5	To design security applications in the field of Information technology									
UNIT	Contents								No. of Hours	
I	Introduction: The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security.								12	
II	Classical Encryption Techniques: Symmetric cipher model – Substitution Techniques: Caesar Cipher – Mono alphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography								12	
III	Block Cipher and DES: Block Cipher Principles – DES – The Strength of DES – RSA: The RSA algorithm.								12	
IV	Network Security Practices: IP Security overview - IP Security architecture – Authentication Header. Web Security: Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction.								12	
V	Intruders – Malicious software – Firewalls.								12	

TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply the different cryptographic operations of public key cryptography	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Apply the various Authentication schemes to simulate different applications.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand various Security practices and System security standards	PO1, PO2, PO3, PO4, PO5, PO6
Text Books		
1.	William Stallings, “Cryptography and Network Security Principles and Practices”.	
Reference Books		
1.	Behrouz A. Foruzan, “Cryptography and Network Security”, Tata McGraw-Hill, 2007.	
2.	AtulKahate, “Cryptography and Network Security”, Second Edition, 2003,TMH.	
3.	M.V. Arun Kumar, “Network Security”, 2011, First Edition, USP.	
Web Resources		
1.	https://www.tutorialspoint.com/cryptography/	
2.	https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	M	M	S	S	M
CO2	S	S	S	M	S	M	S	M	S	S
CO3	S	S	S	S	S	S	S	S	S	M
CO4	S	S	M	S	S	S	S	S	S	S
CO5	M	S	S	S	S	S	S	M	S	M

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	3	2
CO2	3	2	3	2	3	3
CO3	2	3	2	3	2	2
CO4	2	3	3	2	2	3
CO5	3	2	3	3	3	3
Weightage of course contributed to each PSO	13	13	13	12	13	13
Weighted % of Course Contribution to POs	2.6	2.6	2.6	2.4	2.6	2.6

*S-Strong-3; M-Medium-2 ; L-Low-1;

SEMESTER – VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Cloud Computing	Elective VII	5	-	-	-	3	25	75	100
Learning Objectives										
LO1	Learning fundamental concepts and Technologies of Cloud Computing.									
LO2	Learning various cloud service types and their uses and pitfalls.									
LO3	To learn about Cloud Architecture and Application design.									
LO4	To know the various aspects of application design, benchmarking and security on the Cloud.									
LO5	To learn the various Case Studies in Cloud Computing.									
UNIT	Contents								No. of Hours	
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – Map Reduce – Identity and Access Management – Service Level Agreements – Billing.								12	
II	Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service								12	

	<p>Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services</p> <p>Content Delivery Services: Amazon Cloud Front - Windows Azure Content Delivery Network</p> <p>Analytics Services: Amazon Elastic Map Reduce - Google Map Reduce Service - Google Big Query - Windows Azure HD Insight</p>	
III	<p>Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Up gradation – Performance – Référence Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).</p>	12
IV	<p>Cloud Application Bench marking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – WorkloadCharacteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping.</p> <p>Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data atrest, securing data in motion – Key Management – Auditing.</p>	12
V	<p>Case Studies: Cloud Computing for Health care – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.</p>	12

TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the fundamental concepts and Technologies in Cloud Computing.	PO1,PO2, PO3,PO4, PO5, PO6
CO2	Able to understand various cloud service types and their uses and pitfalls.	PO1,PO2, PO3,PO4, PO5, PO6
CO3	Able to understand Cloud Architecture and Application design.	PO1,PO2, PO3, PO4, PO5, PO6
CO4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO1,PO2, PO3,PO4, PO5, PO6
CO5	Understand various Case Studies in Cloud Computing.	PO1,PO2, PO3,PO4, PO5, PO6
Text Books		
1.	Arshdeep Bahga, Vijay Madisetti, Cloud Computing – A Hands On Approach, Universities Press (India) Pvt. Ltd., 2018	
Reference Books		
1.	Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw-Hill, 2013.	
2.	Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd., 2013.	
3.	David Crookes, Cloud Computing in Easy Steps, Tata McGraw Hill, 2015.	
4	Dr. Kumar Saurabh, Cloud Computing, Wiley India, Second Edition 2012.	
Web Resources		
1.	https://en.wikipedia.org/wiki/Cloud_computing	
2.	https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7	

3.	https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf
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Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	M	S	S	S
CO2	S	S	S	S	S	M	S	S	S	M
CO3	S	M	S	S	S	S	S	M	M	S
CO4	S	S	M	S	S	M	S	S	S	S
CO5	M	S	M	S	S	M	S	M	S	M

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	3	3	3	2
CO2	3	2	2	3	3	3
CO3	3	2	3	2	3	3
CO4	3	3	2	3	2	2
CO5	2	3	2	3	3	3
Weightage of course contributed to each PSO	13	12	12	14	14	13
Weighted % of Course Contribution to POs	2.6	2.4	2.4	2.8	2.8	2.6

*S-Strong-3; M-Medium-2 ; L-Low-1;

SEMESTER – VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Big Data Analytics	Elective VIII	5	-	-	-	3	25	75	100
Learning Objectives										
LO1	Understand the Big Data Platform and its Use cases, Map Reduce Jobs									
LO2	To identify and understand the basics of cluster and decision tree									
LO3	To study about the Association Rules, Recommendation System									
LO4	To learn about the concept of stream									
LO5	Understand the concepts of No SQL Databases									
UNIT	Contents								No. of Hours	
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — Map Reduce and YARN — Map Reduce Programming Model								12	
II	Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes.								12	
III	Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of								12	

	Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.	
IV	Introduction to Streams Concepts - Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream - Filtering Streams- Counting Distinct Elements in a Stream -Estimating moments - Counting oneness in a Window -Decaying Window - Real time Analytics Platform(RTAP) applications	12
V	NoSQL Databases : Schema-less Models : Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Work with big data tools and its analysis techniques.	PO1
CO2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
CO3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO5
CO4	Perform analytics on data streams.	PO3,PO5, PO6
CO5	Learn NoSQL databases and management.	PO3, PO4
Text Books		
1.	Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.	
Reference Books		

1.	David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/El sevier Publishers, 2013
2.	EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015.
Web Resources	
1.	https://www.simplilearn.com
2.	https://www.sas.com/en_us/insights/analytics/big-data-analytics.html

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	M	S	S	M
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	M	M	S	S	S	S	S	S	M
CO4	S	M	S	S	S	M	M	S	S	S
CO5	M	S	M	M	S	M	S	M	S	M

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	3	2
CO2	3	2	3	2	3	3
CO3	2	3	2	2	2	2
CO4	3	3	3	3	3	3
CO5	3	2	3	3	3	3
Weightage of course contributed to each PSO	13	13	13	12	14	13
Weighted % of Course Contribution to POs	2.6	2.6	2.6	2.4	2.8	2.6

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER – VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Mobile Ad-hoc Network	Elective VIII	5	-	-	-	3	25	75	100
Learning Objectives										
LO1	To learn about basics concepts of Ad-hoc network models.									
LO2	To learn about Medium Access Protocols (MAC).									
LO3	To learn about Network Routing Protocols and Algorithms.									
LO4	To learn about Delivery and Security in Transport Layer.									
LO5	To learn about cross layer design and optimization techniques, Integration of ad-hoc With Mobile IP networks.									
UNIT	Contents								No. of Hours	
I	Introduction : Introduction to ad-hoc networks definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models in door and out-door models.								12	
II	Medium Access Protocol: MAC Protocols: Design issues, goals and classification. Contention based protocols–with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b 802.11g, 802.15.HIPERLAN.								12	
III	Network Protocols: Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing..								12	
IV	End–end delivery and security: Transport Layer: Issues in designing								12	

	–Transport layer classification, ad-hoc transport protocols. Security issues in ad-hoc networks: issues and challenges, network security attacks, secure routing protocols.	
V	Need for cross layer design ,cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of ad-hoc with Mobile IP networks.	12
TOTAL HOURS		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the basics concepts of Ad-hoc network models.	PO1
CO2	Understand the Medium Access Protocols(MAC).	PO1, PO2
CO3	Understand Network Routing Protocols, design issues and various types of Routing Algorithms.	PO4, PO6
CO4	Understand the concepts of Delivery and Security in Transport Layer.	PO4, PO5, PO6
CO5	Understand cross layer techniques and Integration Of ad-hoc with Mobile IP networks.	PO3, PO8
Text Books		
1.	C.SivaRamMurthyandB.S.Manoj,AdhocWirelessNetworksArchitectureandProtocols II edition Pearson Edition,2007.	
2.	Charles E. Perkins, Ad hoc Networking, Addison –Wesley,2000	
Reference Books		
1.	Stefano Basagni ,Marco Conti, Silvia Giordano and Ivanstojmenovic,Mobile ad-hocnetworking,Wiley-IEEEpress,2004.	
2.	MohammadI lyas,The handbook of ad-hoc wirelesss networks,CRC press,2002.	
3.	T.Camp,J.Boleng,andV.Davies–ASurveyofMobilityModelsforAd-hoc Networkll	
Web Resources		
1.	https://en.wikipedia.org/wiki/Wireless_ad_hoc_network	

2.	https://www.ijert.org/mobile-ad-hoc-network
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Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	M	S	M	M	M	S	S
CO2	S	S	M	S	S	M	S	M	S	M
CO3	M	S	S	M	S	M	S	M	M	M
CO4	S	S	S	S	S	M	S	M	S	M
CO5	S	M	S	S	S	M	S	M	S	M

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	3	3	3	2
CO2	2	3	2	3	3	3
CO3	3	2	3	2	3	3
CO4	3	3	2	3	2	2
CO5	2	2	3	3	3	3
Weightage of course contributed to each PSO	12	12	13	14	14	13
Weighted % of Course Contribution to POs	2.4	2.4	2.6	2.8	2.8	2.6

*S-Strong-3; M-Medium-2 ; L-Low-1;

SEMESTER – VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Quantitative Aptitude	Skill Enha. Course (SEC) VIII	2	-	-	-	2	25	75	100
Learning Objectives										
LO1	To understand the basic concepts of numbers									
LO2	Understand and apply the concept of percentage, profit & loss									
LO3	To study the basic concepts of time and work, interests									
LO4	To learn the concepts of permutation, probability, discounts									
LO5	To study about the concepts of data representation, graphs									
UNIT	Contents								No. of Hours	
I	Numbers-HCF and LCM of numbers-Decimal fractions-Simplification-Square root and cube roots - Average-problems on Numbers.								6	
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership-Chain rule.								6	
III	Time and work - pipes and cisterns - Time and Distance - problems on trains - Boats and streams - simple interest - compound interest - Logarithms - Area-Volume and surface area -races and Games of skill.								6	
IV	Permutation and combination-probability-True Discount-Bankers Discount – Height and Distances-Odd man out & Series.								6	

V	Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs- Pie charts-Line graphs.	6
TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	understand the concepts, application and the problems of numbers	PO1
CO2	To have basic knowledge and understanding about percentage, profit & loss related processing.	PO1, PO2
CO3	To understand the concepts of time and work	PO4, PO6
CO4	Speaks about the concepts of probability, discount	PO4, PO5
CO5	Understanding the concept of problem solving involved in stocks & shares, graphs	PO3, PO6
Text Books		
1.	“Quantitative Aptitude”, R.S.AGGARWAL., S.Chand & Company Ltd.,	
Reference Books		
1.	“Quantitative Aptitude”, Arun Sharma, S.Chand & McGrawHill.	
Web Resources		
1.	https://www.javatpoint.com/aptitude/quantitative	
2.	https://www.toppr.com/guides/quantitative-aptitude/	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	M	M	M	S	M
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	M	S	S	S	S	S	S	S	S
CO4	M	S	M	S	S	M	S	M	S	S
CO5	S	S	S	S	M	M	S	S	S	M

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	3	2	2	2
CO2	2	2	2	3	3	2
CO3	3	2	2	2	3	3
CO4	3	2	3	2	3	3
CO5	2	3	3	2	3	3
Weightage of course contributed to each PSO	12	12	13	11	14	13
Weighted % of Course Contribution to POs	2.4	2.4	2.6	2.2	2.8	2.6

***S-Strong-3; M-Medium-2 ; L-Low-1;**

SEMESTER-VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Extension activity	Supportive	-	-	-	-	1	-	100	100
<p>The institution aims at developing amongst students a sense of participation in nation building through extension and outreach programmes. This deepens understanding of the social environment and enriches her personality through actual participation in day-to-day life of the society. This process of learning is not only a desirable supplement to the classroom education but develops in the student a sense of responsibility, tolerance and cooperation.</p>										
Objectives										
1.	To arouse social consciousness of the students by providing them opportunities to work with and among the people.									
2.	To develop an awareness and knowledge of social realities to have concern for the well being of the community and engage in creative and constructive social action.									
3.	To provide with rich and meaningful educational experiences to them in order to make their education complete and meaningful.									
4.	To develop skill needed in the exercise of democratic leadership and programme development to help them get self-employed.									
5.	To give them the opportunities for their personality development.									
6.	Understand the community in which they work.									
7.	Understand themselves in relation to their community. Identify the needs and problems of the social and involve them in problem solving process.									
8.	Develop among themselves a sense of civic responsibility.									
9.	Utilize their knowledge in finding practical solution to individual and community problems.									

10.	Develop competence required for group-living and sharing of responsibilities.
11.	Gain skill in mobilizing community participation.
12.	Acquire leadership qualities and democratic attitude.
13.	Develop capacity to meet emergencies and natural disasters.
14.	Practice national integration and social harmony.

Evaluation:

The performance of the students in extension activities throughout the semester will be assessed and the credit will be awarded by the faculty.

EXTRA CREDIT PAPER

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	UNDERSTANDING INTERNET	ECP						25	75	100
Learning Objectives										
LO1	Knowledge of Internet medium									
LO2	Internet as a mass medium									
LO3	Features of Internet Technology,									
LO4	Internet as source of infotainment									
LO5	Study of internet audiences and about cyber crime									
UNIT	Contents							No. of Hours		
I	The emergence of internet as a mass medium–the world of ‘world wide web’.							-		
II	Features of internet as a technology.							-		
III	Internet as a source of infotainment – classification based on content and style.							-		
IV	Demographic and psychographic descriptions of internet ‘audiences’ – effect of internet on the values and life-styles.							-		
V	Present issues such as cybercrime and future possibilities.							-		
TOTAL HOURS								-		
Course Outcomes								Programme Outcomes		
CO	On completion of this course, students will									

CO1	Knows the basic concept in internet Concept of mass medium and world wide web	PO1,PO2, PO3,PO4, PO5, PO6
CO2	Knows the concept of internet as a technology.	PO1,PO2, PO3,PO4, PO5, PO6
CO3	Understand the concept of infotainment and classification based on content and style	PO1,PO2, PO3, PO4, PO5, PO6
CO4	Can be able to know about Demographic and psychographic description of internet	PO1,PO2, PO3,PO4, PO5, PO6
CO5	Understand the concept of cyber crime and future possibilities	PO1,PO2, PO3,PO4, PO5, PO6
Text Books		
1.	Barnouw, E and Krishna swamy S [1990] Indian Film. New York, OUP.	
2.	Kumar, Keval [1999] Mass Communication in India. Mumbai, Jaico.	
3.	Srivastava, K M [1992] Media Issues. Sterling Publishers Pvt Ltd.	
Reference Books		
1.	Acharya, R N [1987] Television in India. Manas Publications, New Delhi.	
2.	Barnouw, E [1974] Documentary – A History of Nonfiction. Oxford, OUP	
3.	Luthra, H R [1986] Indian Broadcasting. Ministry of I& B, New Delhi.	
4.	Vasudev, Aruna [1986] The New Indian Cinema. Macmillan India, New Delhi.	
Web Resources		
1.	https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf	
2.	https://www.w3schools.com/html/default.asp	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	M	M	S	S	S
CO2	S	S	M	S	S	S	S	S	S	S
CO3	S	S	S	M	M	S	S	S	S	S
CO4	M	M	S	S	S	S	S	M	S	M
CO5	M	S	S	S	M	M	S	S	S	S

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	3	3
CO3	2	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15
Weighted % of Course Contribution to POs	2.8	3	2.8	2.8	3	3

*S-Strong-3; M-Medium-2 ; L-Low-1;

EXTRA CREDIT PAPER

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	TALLY LAB	ECP						25	75	100
Learning Objectives										
LO1	To learn basics of accountancy, its principles, concepts. conventions, recording procedures, bank reconciliation, final accounts etc.									
LO2	To learn and practice computerized accounting systems using tally.									
LO3	To impart knowledge regarding concepts of financial accounting.									
LO4	To learn and perform accounting, inventory.									
LO5	To provide practical knowledge about tally, advanced excel and Google forms is given to students.									
S.NO	LAB EXERCISES									
1.	Company Creation & Accounts master creation									
2.	Voucher Entry (2 Programs)									
3.	Day Book preparation									
4.	Preparation of Trial Balance									
5.	Preparation of Final Accounts (Profit & Loss A/c & Balance Sheet)									
Course Outcomes							Programme Outcomes			
CO	On completion of this course, students will									

CO1	Get idea about creation and alteration of company profile	PO1,PO2, PO3,PO4, PO5, PO6
CO2	Understand and apply various accounting voucher entries	PO1,PO2, PO3,PO4, PO5, PO6
CO3	Acquire the knowledge in bank reconciliation statement preparation and stock summary.	PO1,PO2, PO3, PO4, PO5, PO6
CO4	Designed to impart knowledge regarding concepts of Financial Accounting.	PO1,PO2, PO3,PO4, PO5, PO6
CO5	Required skills and can also be employed as Tally data entry operator.	PO1,PO2, PO3,PO4, PO5, PO6
Reference Books		
1.	Rajesh chheda, “Learn tally.ERP9 with GST & E-way Bill”-Ane books Pvt. Ltd.,	
2.	S.Lakshmipathi, “Learn tally.ERP9 with GST”	
3.	Rakesh Sangwan, “Learn tally prime” –Ascent prime publications.	
Web Resources		
1.	http://cleartax.in	
2.	http://tallysolutions.com	
3.	http://help.tallysolutions.com	
4.	http://tallyerp9book.com	

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	S	M	S	S	M
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	M	S	S	S	S	S	S	M
CO4	M	S	S	S	M	M	S	S	S	S
CO5	S	M	S	S	M	S	S	M	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	3	3
CO3	2	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15
Weighted % of Course Contribution to POs	2.8	3	2.8	2.8	3	3

***S-Strong-3; M-Medium-2 ; L-Low-1;**

EXTRA CREDIT PAPER

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	IPR, PLAGIARISM, COPYRIGHTS AND PATENTS	ECP	-	-	-	-	2	-	-	100
Learning Objectives										
LO1	To provides the fundamental aspects of Intellectual property Rights									
LO2	To play a major role in development and management of innovative projects in industries.									
LO3	To stimulate the creation and growth of intellectual properties by undertaking relevant measures.									
LO4	To create an atmosphere of inventibility and innovation.									
LO5	To learn the procedure of obtaining patents copyrights trademarks and industrial design.									
UNIT	Contents								No. of Hours	
I	Introduction to IPR, Overview, Importance, IPR in India and IPR abroad								-	
II	Plagiarism, Etymology, Legal aspects, Academic plagiarism, Journalism, Self plagiarism.								-	
III	Copyrights, Infringement: Searching, Filing, Distinction between related and copy rights, Trademarks, Role in commerce, Importance, Protection, Registration, Domain names, Trademark Protection Vs. Domain Name Protection, Protection of Domain Names in India.								-	
IV	Patents, Granting, Industrial Designs, Design Patents, Scope, Protection, Filing infringement, Difference between Designs, Patents, International Treaties - Geographical Indications, International protection								-	
V	Licensing, Commercialization, Advantages and Disadvantages of a Licensing Agreement, Criminal laws, Case studies in IPR.								-	

TOTAL HOURS		-
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand and use the basic concepts of Intellectual property Rights	PO1,PO2, PO3,PO4, PO5, PO6
CO2	Examine the Concepts of Intellectual property Rights such as Plagiarism, Copyrights, Infringement, Patents and Licensing	PO1,PO2, PO3,PO4, PO5, PO6
CO3	To identify the significance of practice and procedure of Patents.	PO1,PO2, PO3, PO4, PO5, PO6
CO4	Demonstrate the procedure obtaining copyrights, Trademarks and Industrial Design.	PO1,PO2, PO3,PO4, PO5, PO6
CO5	Evaluate to enable the students to keep their IP rights alive	PO1,PO2, PO3,PO4, PO5, PO6
Text Books		
1.	T. M Murray and M.J. Mehlman, Encyclopedia of Ethical, Legal and Policy issues in Biotechnology, John Wiley Sons, 2000.	
2.	S.Sasikala, Inculcating Ethics on “IPR, Plagiarism, Copyrights and Patents”, Teachers Publishing House, 2018.	
Reference Books		
1.	Ajit Parulekar and Sarita D’ Souza, Indian Patents Law – Legal; Business Implications, Macmillan India Ltd, 2006.	
2.	B.L.Wadehra, Law Relating to Patents, Trade Marks, Copyright, Designs; Geographical	

	Indications, Universal law Publishing Pvt. Ltd., India, 2000.
Web Resources	
1.	https://www.edx.org
2.	http://www.enago.com/intellutual-property-rights-what-researchs-need-to-know/
3.	http://library.alliant.edu/screens/plagiarism.pdf
4.	http://www.wipo.int/edocs/pubdocs/en/copyrights/868/wipo_pub_868.pdf
5.	http://www.plagiarism.org-article/what-is-plagiarism

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	M	S	S	S
CO2	M	S	S	S	M	M	S	M	S	M
CO3	S	M	S	S	S	S	S	S	S	S
CO4	S	S	S	M	S	M	S	M	S	M
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	2
CO2	3	3	2	2	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	2	3	3
Weightage of course contributed to each PSO	15	15	14	13	15	14
Weighted % of Course Contribution to POs	3	3	2.8	2.6	3	2.8

***S-Strong-3; M-Medium-2 ; L-Low-1;**

VALUE ADDED COURSE

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	HARDWARE AND TROUBLESHOOTING	VAC	-	-	-	-	-	-	-	100
Learning Objectives										
LO1	Indicate the names and functions of Hardware ports and the parts of the Motherboard.									
LO2	Identify the names and distinguishing features of different kinds of input and output devices.									
LO3	Describe how the CPU processes data and instructions and controls the operations of all other devices.									
LO4	Identify the names, distinguishing features, and units for measuring different kinds of memory and storage devices.									
LO5	Search your personal computer for the various Hardware components its contains.									
UNIT	Contents								No. of Hours	
I	Introduction: Mother boards & its types-ports, slots, connectors, add on cards, power supply units and cabinet types.								-	
II	Storage Devices: Primary & Secondary storage medium-magnetic disc, RAM, ROM, PROM, EPROM, Floppy, CD-ROM, CD-R/W, DVD.								-	
III	Hardware Trouble shooting: Printers, Floppy drive, Microphone.								-	
IV	Hardware Troubleshooting: Scanner, Network, Hardware failure, Testing, CMOS, CDROM, Hard disk drive								-	
V	Hardware Troubleshooting: Monitor, Mother Board, Sound Card and Video Card.								-	
TOTAL HOURS								-		
Course Outcomes								Programme Outcomes		

CO	On completion of this course, students will	
CO1	Obtaining knowledge of troubleshoot the hardware components of a computer.	PO1,PO2, PO3,PO4, PO5, PO6
CO2	Comprehending the troubleshooting techniques for storage devices, input and output devices.	PO1,PO2, PO3,PO4, PO5, PO6
CO3	Applying the troubleshooting techniques for hardware failures.	PO1,PO2, PO3, PO4, PO5, PO6
CO4	Examining the troubleshooting techniques in Network, Printers and Mother board.	PO1,PO2, PO3,PO4, PO5, PO6
CO5	Assembling a new system with standard hardware component	PO1,PO2, PO3,PO4, PO5, PO6
Text Books		
1.	Stephen J.Bigelow, Trouble Shooting, maintaining and Repairing PCsll, Tata McGraw-Hill, New Delhi, 2001.	
Reference Books		
1.	Craig Zacker& John Rourke, —The Complete Reference: PC Hardware, Tata McGraw-Hill, New Delhi, 2001	
2.	Mike Meyers, —Introduction to PC Hardware and Trouble Shooting, Tata McGraw Hill, New Delhi, 2003.	
3.	B.Govindarajulu, —IBM PC and Clones Hardware Trouble Shooting and Maintenance, Tata McGraw-Hill, New Delhi, 2002.	
Web Resources		
1.	https://www.edx.org	

2.	https://www.pluralsight.com
3.	https://www.makeuseof.com
4.	https://www.computerhope.com
5.	https://www.techtarget.com

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	M	M	S	S
CO2	M	S	S	M	S	M	S	M	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	S	S	S	M
CO5	S	M	S	S	S	M	S	M	S	S

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	3
CO3	2	3	3	3	3	3
CO4	3	3	2	3	2	3
CO5	3	3	3	2	3	2
Weightage of course contributed to each PSO	14	15	13	14	13	14
Weighted % of Course Contribution to POs	2.8	3	2.6	2.8	2.6	2.8

***S-Strong-3; M-Medium-2 ; L-Low-1;**

VALUE ADDED COURSE

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Application Development in Programming Languages	VAC	-	-	-	-	-	-	-	100
Learning Objectives										
LO1	Use their learned skills, knowledge and abilities to develop websites for the internet.									
LO2	Apply basic programming principles to the construction of websites.									
LO3	Use the major Techniques for solving problems									
LO4	To solve real world problems with digital design.									
LO5	To make students Understand the techniques using traces for faster application development.									
UNIT	Contents								No. of Hours	
I	Introduction- Categories of Programming Languages - Interpreted Programming Languages: Introduction – Examples - Advantages and disadvantages. Compiled Programming Languages: Introduction – Advantages and Disadvantages – Examples.								-	
II	Functional Programming Languages: Introduction – Categories –Examples. Scripting Languages: Introduction- Advantages – Disadvantages- Examples. Markup Languages: Introduction –Examples.								-	
III	Application Development in Structured Programming								-	
IV	Application Development in Object Oriented Programming								-	
V	Programming Languages used in most popular websites: Google.com Facebook.com YouTube.com –Yahoo-Amazon.Com – Wikipedia.org-Twitter.com – LinkedIn.com.								-	

TOTAL HOURS		-
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Acquiring the knowledge of Application Development in Programming Languages	PO1,PO2, PO3,PO4, PO5, PO6
CO2	Understanding the concept of interpreter and Compiler	PO1,PO2, PO3,PO4, PO5, PO6
CO3	Illustrating categories of programming languages	PO1,PO2, PO3, PO4, PO5, PO6
CO4	Correlating various programming languages used in popular website	PO1,PO2, PO3,PO4, PO5, PO6
CO5	Developing simple applications in structured and object oriented Programming Languages.	PO1,PO2, PO3,PO4, PO5, PO6
Text Books		
1.	Robert W.Sebesta, “Concepts of Programming Languages”, Tenth Edition, Pearson Education India, 2013.	
2.	Mandhir Verma, “An Indroduction to Principles of Programming Languages”, Vayu Education of India, 2013.	
Reference Books		
1.	Terrance W. Pratt, Marvin V.Zelkowitz, T.V.Gopal, “Programming Languages Design and Implementation”, fourth edition, Pearson Education India, 2006.	
2.	Kenneth C.Louden, Kenneth A. Lambert, “Programming Language Principles and Practices”,	

	3 rd Edition, 2012.
Web Resources	
1.	https://www.edx.org
2.	https://www.typesnuses.com/types-of-programming-languages-with-differences/
3.	https://en.wikipedia.org/wiki/C_(programming_language)
4.	https://en.wikipedia.org/wiki/Object-oriented_programming
5.	https://en.wikipedia.org/wiki/Programming_languages_used_in_most_popular_we

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	M	M	S	S	S
CO2	S	S	S	S	S	M	S	M	S	M
CO3	S	S	S	M	S	S	S	S	S	S
CO4	M	M	S	S	S	S	S	M	S	M
CO5	S	M	S	M	S	M	S	S	S	S

***S-Strong-3; M-Medium-2 ; L-Low-1;**

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	3	3	3	3
CO2	3	3	2	3	3	3
CO3	2	2	3	3	3	3
CO4	3	3	3	3	3	3
CO5	2	3	2	2	3	2
Weightage of course contributed to each PSO	12	14	13	14	15	14
Weighted % of Course Contribution to POs	2.4	2.8	2.6	2.8	3	2.8

***S-Strong-3; M-Medium-2 ; L-Low-1;**

VALUE ADDED COURSE

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	COMPUTER FOR DIGITAL ERA	VAC	-	-	-	-	-	-	-	100
Learning Objectives										
LO1	To create the awareness about the digital India among the student community.									
LO2	To create the awareness about the e-learning and security issues.									
LO3	To make the student to understand the role of computer in the day to day living.									
LO4	Identify the areas where he can extend the digital computing for their benefits.									
LO5	To identify the significant challenges of digital technologies in education.									
UNIT	Contents								No. of Hours	
I	INTRODUCTION TO COMPUTER NETWORKS – LAN – WAN – MAN – Wired and wireless network – WiFi Networks - Network Devices – Modem – Switch – Router – Broad Band – Leased Lines Internet.								-	
II	INTERNET: WWW – URL- Browser – e-mail – SMS – MMS - Client Server Computing.								-	
III	E GOVERNANCE IN INDIA: E-Governance initiative by the Government – Digital India Platform –GIS – Mobile Seva App Store- GARV- Grameen Vidyutikaran.								-	
IV	E -LEARNING AND MOOC: E – Learning – Digital Library – E- Journals – Introduction to MOOC – Edex – Course era etc -SWAYAM – NPTEL .								-	
V	CYBER SECURITY – Virus – Malware – Network Security - Hacking – Big Data – Data Analytics – Social Networks – Social Media Analytics- Introduction to IT Act.								-	

TOTAL HOURS		-
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Get an idea about computer and apply the computing technology in their day to day life.	PO1,PO2, PO3,PO4, PO5, PO6
CO2	Acquire the knowledge about digital India initiatives to their surroundings.	PO1,PO2, PO3,PO4, PO5, PO6
CO3	Enhancing the digital skill-set required in workplace.	PO1,PO2, PO3, PO4, PO5, PO6
CO4	To understand about the E- learning and Security issues.	PO1,PO2, PO3,PO4, PO5, PO6
CO5	To create awareness about MOOC, SWAYAM, NPTEL courses.	PO1,PO2, PO3,PO4, PO5, PO6
Text Books		
1.	E- Materials of Manonmaniam Sundaranar University on “Computer for Digital Era”,	
2.	http://msuniv.ac.in	
Reference Books		
1.	Andrew S.Tanenbawm, Computer Network by, PHI, 4th Edition, 2003.	
2.	Gautam shroff, Enterprise cloud computing technology, Architecture, Applications, Cambridge University Press,First Edition, 2010.	
Web Resources		
1.	https://www.swayam.gov.in	

2.	https://www.mooc.org
3.	http://www.digitalindia.gov.in
4.	https://www.edx.org
5.	https://www.meity.gov.in
6.	https://www.clear-tax.in

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	S	M	S	M	S	M
CO2	S	M	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	S	S	M
CO4	S	M	S	M	S	S	S	S	S	S
CO5	M	S	S	S	M	S	M	M	S	M

*S-Strong-3; M-Medium-2 ; L-Low-1;

Mapping with Programme Specific Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	3	3	3
CO2	3	3	2	3	3	3
CO3	2	3	3	3	3	3
CO4	3	3	3	2	3	3
CO5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	14	14	13	15	15
Weighted % of Course Contribution to POs	2.8	2.8	2.8	2.6	3	3

***S-Strong-3; M-Medium-2 ; L-Low-1;**