VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN

ELAYAMPALAYAM, TIRUCHENGODE (Tk.), NAMAKKAL (Dt.).

[AN ISO 9001 : 2015 CERTIFIED INSTITUTIONS]
Affiliated to Periyar University, Approved by AICTE
&Re-Accredited with 'A+' Grade by NAAC,
Recognized under section 2(f) & 12(B) of UGC Act, 1956)
ELAYAMPALAYAM, TIRUCHENGODE (Tk.), NAMAKKAL (Dt.)

AUTONOMOUS

PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS

B.Sc. (INFORMATION TECHNOLOGY)

SYLLABUS & REGULATIONS

FOR CANDIDATES ADMITTED FROM 2024-25 ONWARDS
UNDER AUTONOMOUS & OBE PATTERN

VIVEKANANDHA EDUCATIONAL INSTITUTIONS

Angammal Educational Trust

Elayampalayam, Tiruchengode (Tk.), Namakkal (DT)

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

B.Sc (INFORMATION TECHNOLOGY)

(Candidates admitted from 2023-2024 onwards)

REGULATIONS

I. SCOPE OF THE PROGRAMME

Bachelor of Information Technology can be considered to be one of the most prominent UG level programs in our country. This program mainly deals with the development of computer applications for the purpose of updating computer programming languages. B.Sc.CS [Cyber Security] also aims at creating strong knowledge of theoretical Information Technology subjects who can be employed in software development and testing units of industries. The course has a time period of 3 years with 6 semesters.

II. SALIENT FEATURES

- Regular conduct of guest lectures and seminars
- Campus recruitment
- Provides facilities such as Internet Access and In-House Library
- Provides Career Guidance for Post Graduate Courses like M.Sc, and the Certifications in programming languages
- Conduct of Personality Development Program
- Visiting Faculties from Industries

III. OBJECTIVES OF THE PROGRAMME

The Course Objective of the B.Sc. Information Technology program is to provide advanced and in-depth knowledge of Information Technology and its applications to enable students pursue a professional career in Information and Communication Technology in related industry, business and research. The course designed to impact professional knowledge and practical skills to the students.

IV. ELIGIBILITY FOR ADMISSION

A Candidates seeking admission to the first year Degree course (B.Sc. Information Technology) shall be required to have passed Higher Secondary Examination with Mathematics or Business

Mathematics or Computer Science or Computer Applications or Computer Technology or Statistics (Academic Stream or Vocational Stream) as one of the subject under Higher Secondary Board of Examination, conducted by the Government of Tamilnadu or an examination accepted as equivalent thereto by the syndicate, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the B.Sc. Information Technology Degree Examination of Periyar University after a course of study of three academic years.

V. DURATION OF THE PROGRAMME

- The course shall extend over a period of three academic years consisting of six semesters. Each academic year will be divided into two semesters. The First semester will consist of the period from July to November and the Second semester from December to April.
- The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women with the approval of Periyar University.

VI. CONTINUOUS INTERNAL ASSESSMENT (CIA)

The performance of the students will be assessed continuously and the Internal

ASSESSMENT MARKS **FOR THEORY PAPERS** WILL BE AS UNDER:

1	Average of Two Tests	-	05
2	Model Exam	-	10
3	Assignment	-	05
4	Attendance	-	05
	To	-	25

ASSESSMENT MARKS **FOR PRACTICAL PAPERS** WILL BE AS UNDER:

1	Model Exam	-	20
2	Observation Note	-	10
3	Attendance	-	10
	To	-	40

PASSING MINIMUM - EXTERNAL

THEORY	In the End Semester Examinations, the passing minimum shall be 40% out of 75 Marks. (30 Marks)
PRACTICAL / MINI PROJECT	In the End Semester Examinations, the passing minimum shall be 40% out of 60 Marks. (24 Marks)

VII. ELIGIBILITY FOR EXAMINATION

A candidate will be permitted to appear for the University Examination only on learning 75 % of attendance and only when her conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed.

DISTRIBUTION OF MARKS FOR ATTENDANCE:

ATTENDANCE PERCENTAGE	MARKS	
	THEORY	PRACTICAL
75-80	1	2
81-85	2	4
86-90	3	6
91-95	4	8
96-100	5	10

VIII. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Successful candidates passing the Examination of Core Courses (Main & Allied Subjects) & Securing Marks.

a) 75 % and above shall be declared to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
b) 60% and above but below 75 % shall be declared to have passed the Examinations in First Class..
c) 50% & above but below 60% shall be declared to have passed the examinations in Second Class.
d) All the remaining successful candidates shall be declared to have passed the examinations in Third Class.
e) Candidates who pass all the examinations prescribed for the course at the First appearance itself and within a period of three Consecutive Academic years from the year of admission only will be eligible for University Rank.

IX. ELIGIBILITY FOR AWARD OF THE DEGREE

A candidate shall be eligible for the award of the Degree only if she has undergone the above Degree for a period of not less than Three Academic years comprising of six semesters and passed the Examinations prescribed and fulfilled such conditions has have been prescribed therefore.

X. PROCEDURE IN THE EVENT OF FAILURE

If a candidate fails in a particular subject, she may reappear for the university examination in the concerned subject in subsequent semesters and shall pass the examination.

XI. COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2023-2024 (i.e.,) for the students who are to be admitted to the First year of the course during the Academic year 2023-24 and thereafter.

XII. TRANSITORY PROVISIONS

Candidates who were admitted to the UG course of study before 2021-2022 shall be permitted to appear for the examinations under those regulations for the period of Three years ie., upto and inclusive of the Examinations of 2023-2024. Thereafter, they will be permitted to appear for the examinations only under the regulations then in force.

EVALUATION OF EXTERNAL EXAMINATIONS (EE)

QUESTION PAPER PATTERN – Theory	
Time duration: 3 Hours	**Max. Marks: 75**
PART- A: **(10 x 1= 10)**	Answer all the Questions Two Questions from each Unit
PART- B: **(5x 7 = 35)**	Answer all the questions One Question from each Unit (Either or Type)
PART- C: **(3 x 10 = 30)**	Answer any **THREE** of the questions One Question from each Unit (3 Out of 5)
IN THE END SEMESTER EXAMINATIONS, THE PASSING MINIMUM SHALL BE 40% OUT OF 75 MARKS. (30 MARKS)	

QUESTION PAPER PATTERN – Practical	
Time duration: 3 Hours	**Max. Marks: 60**
1. One compulsory question from the given list of objectives	**30 Marks**
2. One either/or type question from the given list of objectives	**30 Marks**
IN THE END SEMESTER EXAMINATIONS, THE PASSING MINIMUM SHALL BE 40% OUT OF 60 MARKS. (24 MARKS)	

Programme outcomes (PO) for B.Sc (Information Technology)

- Scientific aptitude will be developed in Students
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the 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 Mathematics and aligned areas . This Programme helps learners in building a solid foundation for higher studies in Mathematics
- The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modeling and solving real life problems.
- Utilize mathematics 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 benefitting from knowledge and insight of others.
- Mould the students into responsible citizens in a rapidly changing interdependent 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

Programme Specific Outcomes of B.Sc Degree programme in Information Technology

PSO1 Demonstrate and apply basic knowledge of information technology to the scientific issues and problems being faced in society and the industry.

PSO2 Analyze critical problems and provide computer-based solutions by applying appropriate tools and technology.

PSO3 Design and develop solutions to problems in the areas related to web page design, Mobile App development, cloud computing, IOT and data analytics of varying complexity.

2. Highlights of the Revamped Curriculum:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Internship during the second year vacation will help the students gain valuable work experiences, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations.

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(AUTONOMOUS)

PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

B.Sc., INFORMATION TECHNOLOGY

CURRICULUM FOR ACADEMIC YEAR 2024 – 2025

Course Pattern and Scheme of Examinations under Autonomous, OBE Pattern

FOR THE CANDIDATES ADMITTED FROM THE YEAR 2024 – 2025

SEMESTER: I & II

SEM	PART	COURSECODE	COURSETITLE	Hrs	CREDIT	MARKS		
						C IA	EE	TOT
I	I	23U1LT01	Tamil- I	6	3	25	75	100
	II	23U1LE01	English - I	4	3	25	75	100
	III	23U1MAGE01	Allied Mathematics - I:	4	3	25	75	100
	III	24U1ITC01	**Core - I**: Computer Fundamentals with Python Programming	5	4	25	75	100
	III	24U1ITCP01	**Core Practical-I**: Python Programming Lab	5	3	40	60	100
	III	24U1CSAC01	Ability Enhancement Compulsory Course (AECC I) – Introduction to HTML	2	2	25	75	100
	III	23U1ENAC01	Soft Skills for Effective Communication	2	2	25	75	100
	IV	23U1VE01	Value Education	2	2	25	75	100
	Total			**30**	**22**	**215**	**585**	**800**
II	I	23U2LT02	Tamil – II	5	3	25	75	100
	II	23U1LE01	English – II	5	3	25	75	100
	III	23U1MAGE07	Allied Mathematics II:	4	3	25	75	100
	III	24U2ITC02	**Core-II**: Data Structures using Java	5	4	25	75	100
	III	24U2ITCP02	**Core Practical-II**: Data Structures using Java Lab	5	3	40	60	100
	IV	23U2CSAC02	Ability Enhancement Compulsory Course (AECC 2) Soft Skill-2: Office Automation	2	2	25	75	100
	IV	24U2ITS01	Human Computer Interaction	2	2	25	75	100
	IV	24U3EVS01	Environmental Studies	2	2	25	75	100
	Total			**30**	**22**	**190**	**510**	**700**

SEMESTER: III&IV

Sem	Part	Course Code	COURSETITLE	Hrs	CREDIT	MARKS		
						CIA	EE	TOT
III	I	23U3LT03	Foundation Tamil - III	5	3	25	75	100
	II	23U3LE03	Foundation English - III	5	3	25	75	100
	III		Allied-III:	4	3	25	75	100
	III	24U3ITC03	**Core - III**: Database Management System	4	3	25	75	100
	III	24U3ITCP03	**Core Practical - III**: Postgre SQL Lab	3	2	40	60	100
	III	DSE - I	Discipline Elective -I	4	3	25	75	100
	III	24U3ITC04	**Core-IV:** Microsoft Power BI	3	3	25	75	100
	IV		Non Major Elective Course - 01	2	2	25	75	100
			Total	**30**	**22**	**215**	**585**	**800**
IV	I	23U4LT04	Tamil - IV	5	3	25	75	100
	II	23U4LE03	Foundation English - IV	5	3	25	75	100
	III		Allied – IV:	4	3	25	75	100
	III	24U4ITC05	Core-V: Data Analytics	4	3	25	75	100
	III	24U4ITCP05	Practical-IV: Data Analytics using Apache Kafka Lab	3	3	40	60	100
	III	DSE - II	Discipline Elective -II	4	3	25	75	100
	III	24U4ITCP06	Practical-IV: R Programming Lab	3	2	40	60	100
	IV		NMEC	2	2	25	75	100
			Total	**30**	**22**	**230**	**570**	**800**

SEMESTER: V &VI

SEM	Part	COURSECODE	COURSETITLE	Hrs	CREDIT	MARKS		
						CIA	EE	TOT
V	III	24U5ITC06	Core-VI: Artificial Intelligence using Python	5	4	25	75	100
	III	24U5ITCP07	Practical-V: Artificial Intelligence using Python Lab	4	3	40	60	100
	III	24U5ITCP08	Practical-VI: MicroSoft Azure Fundamental AI 900 Lab	5	4	40	60	100
	III	DSE – III	Discipline Elective - III	5	4	25	75	100
	III	DSE – IV	Discipline Elective - IV	5	4	25	75	100
	III	24U5ITPR01	Mini Project	4	4	40	60	100
	IV		SBEC II:	2	2	25	75	100
	V	24U5ITIN01	Internship	-	1	-	-	-
	Total			**30**	**26**	**220**	**480**	**700**
VI	III	24U6ITC07	Core-VII: UI Path Automation RPA	5	4	25	75	100
	III	24U6ITCP09	Practical-VII: UI Path Automation RPA Lab	4	3	40	60	100
	III	24U6ITC08	Core-VIII: Introduction to Deep Learning	5	4	25	75	100
	III	DSE – V	Discipline Elective - V	5	4	25	75	100
	III	DSE – VI	Discipline Elective - VI	4	4	25	75	100
	III	24U6ITPR02	Project with viva voce	5	4	40	60	100
	IV		SBEC - III	2	2	25	75	100
	V		Extension Activity	-	1	-	-	-
	Total			**30**	**26**	**205**	**495**	**700**
Grand Total				**180**	**140**	**1300**	**3300**	**4600**

DECIPLINE SPECIFIC ELECTIVES

Course Code	DSE	Course Name	Semester
24U3ITDE01	DSE – I	Cryptography & Network Security	Semester: III
24U3ITDE02	DSE – I	Fundamentals of Artificial intelligence	Semester: III
24U3ITDE03	DSE – I	Operating system	Semester: III
24U4ITDE04	DSE – II	Data science using R Programming	Semester: IV
24U4ITDE05	DSE – II	Internet Of Things	Semester: IV
24U4ITDE06	DSE – II	Pervasive Computing	Semester: IV
24U5ITDE07	DSE – III	Microsoft Azure Fundamental AI 900	Semester: V
24U5ITDE08	DSE – III	Quantum Computing	Semester: V
24U5ITDE09	DSE – III	Cyber Security	Semester: V
24U5ITDE10	DSE – IV	Web Application Development	Semester: V
24U5ITDE11	DSE – IV	Machine Learning	Semester: V
24U5ITDE12	DSE – IV	Compiler Design	Semester: V
24U6ITDE13	DSE – V	Computer Vision & Virtual Reality	Semester: VI
24U6ITDE14	DSE – V	Computational thinking	Semester: VI
24U6ITDE15	DSE – V	Neural Networks and Fuzzy Logic	Semester: VI
24U6ITDE16	DSE – VI	Block Chain Technology	Semester: VI
24U6ITDE17	DSE – VI	Ethical Hacking	Semester: VI
24U6ITDE18	DSE – VI	Data Mining and warehousing	Semester: VI

Skill Based Elective Courses (SBEC) (Offer to Same Students)

Course Code	Course Name	Semester
24U5ITS01	Human Computer Interaction	Semester: II
24U5ITS02	Social Media & Security	Semester: II
24U6ITS03	Advance Excel	Semester: V
24U6ITS04	Professional Ethics	Semester: V
24U6ITS05	Academic Writing and Academic portfolio	Semester: VI
24U6ITS06	Sentimental Analysis	Semester: VI
24U6ITS07	Analytical Skills	Semester: VI

SEMESTER I

SUBJECT TITLE	COMPUTER FUNDAMENTALS WITH PYTHON PROGRAMMING	SEMESTER	I
SUBJECT CODE	24U1ITC01	SPECIALIZATION	NA
TYPE	CORE: THEORY	L:T:P:C	5:0:0:5

COURSE OBJECTIVE:

1. Students get basic knowledge of computer fundamentals.
2. Students learn about number systems and logic gates.
3. Students learn about Circuits and Operating System
4. Build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions
5. Work with user input to create fun and interactive programs

CO No.	CO Statement	Knowledge Level
CO1	Develop and execute simple Python programs	K1
CO2	Decompose a Python program into functions	K2,K4
CO3	Write simple Python programs using conditionals and looping for solving problems	K3
CO4	Represent compound data using Python lists, tuples, dictionaries etc.	K4
CO5	Read and write data from/to files in Python programs	K4

UNIT	CONTENTS	NO. OF SESSIONS
I	**Introduction to Computers**: Introduction – Characteristics – Generation of computers – Classification of digital computer system – Functions & Components of computer system - Input devices: Keyboard – mouse - OCR – OMR – Touch screen. Output Devices: Monitor – Printer: Dot matrix, laser printer.	12
II	**Memory and Storage**: Memory Basics, The RAM, The ROM, Programmable ROMs, The Flash Memory, Memory Expansion, Special Types of Memories, Magnetic and Optical Storage.	12
III	**Python programming language** - Literals - Variables and Identifiers - Operators - Expressions and Data types, Input / output. Text Files: Opening, reading and writing text files – String Processing- Exception Handling.	12
IV	**Control Structures:** Boolean Expressions - Selection Control - If Statement- Indentation in Python- Multi-Way Selection -Iterative Control- While Statement- Infinite loops- Definite vs. Indefinite Loops- Boolean Flag. String, List and Dictionary, Manipulations Building blocks of python programs, Understanding and using ranges.	12
V	**Functions:** Program Routines- Defining Functions- More on Functions: Calling Value-Returning Functions- Calling Non-Value-Returning Functions- Parameter Passing - Keyword Arguments in Python - Default Arguments in Python-Variable Scope. . Recursion: Recursive Functions.	12

LEARNING RESOURCES

TEXT BOOKS	1. "Fundamentals of Computer Science & Communication Engineering". Alexis Leon, Mathew's Leon, Vikas Publishing house, New Delhi, 2012 (Unit I: Chapters 2, 3, 4, 6, 7, 8, 9 & 10) 2. "Digital Computer Fundamentals" Thomas C Bartee, 6th Edition TMH Publisher, New Delhi, 2011 (Unit II: Chapters 2 & 3). 3. Charles Dierbach, "Introduction to Computer Science using Python - A computational Problem solving Focus", Wiley India Edition, 2015.
REFERENCE BOOKS	1. Bartee, Thomas C, "Digital Computer Fundamentals", 6th Edition, TMH, 1995. 2. Mark Lutz, "Learning Python Powerful Object Oriented Programming", O'reilly Media 2018, 5th Edition. 3. Timothy A. Budd, "Exploring Python", Tata MCGraw Hill Education Private Limited 2011, 1 st Edition. 4. John Zelle, "Python Programming: An Introduction to Computer Science", Second edition, Course Technology Cengage Learning Publications, 2013, ISBN 978- 1590282410
WEBSITE/LINK	1. http://bedford-computing.co.uk/learning/wp-content/uploads/2015/10/Introduction-to-Computer-Science-Using-Python.pdf 2. www.tutorialspoint.com/cprogramming/ 3. www.programiz.com/c – programming

MAPPING WITH PROGRAMME OUTCOMES

	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong, M- Medium, L – Low

SUBJECT TITLE	PYTHON PROGRAMMING LAB	SEMESTER	I
SUBJECT CODE	24U1ITCP01	SPECIALIZATION	NA
TYPE	CORE: PRACTICAL	L:T:P:C	5:0:0:4

LIST OF EXPERIMENTS

1. Write a program to demonstrate different number data types in Python.
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a Python program using List, Tuples and List comprehensions.
4. Write a Python program using Control statements.
5. Write a Python program using Functions and String Operations.
6. Write a Python program using Text Files.
7. Write a Python program using Exceptional Handling.
8. Write a Python program using Inheritance.
9. Write a program to demonstrate working with dictionaries in python.
10. Write a python program to find factorial of a number using Recursion.

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	INTRODUCTION TO HTML	Skill Enha. Course (SEC)	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 Webpage –HTML Basics: Understanding tags.	**6**
II	Tags for Document structure (HTML, Head, Body Tag). Block level text elements: Headingsparagraph (<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–Rowspan, Colspan–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 HTMLConcept 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
Textbooks		
1	"Mastering HTML5 and CSS3 Made Easy", Teach U Comp Inc., 2014.	
2	Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"	

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 Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15

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

SEMESTER II

SUBJECT TITLE	DATA STRUCTURES USING JAVA	SEMESTER	II
SUBJECT CODE	24U2ITC02	SPECIALIZATION	NA
TYPE	CORE: THEORY	L:T:P:C	5:0:0:5

COURSE OBJECTIVE:

1. To learn why Java is useful for the design of desktop and web applications.
2. To learn how to implement object-oriented designs with Java.
3. To impart the basic concepts of data structures and algorithms.
4. To acquaint the student with the basics of the various data structures and make the students knowledgeable in the area of data structures.
5. This course also gives insight into the various algorithm design techniques

CO No.	CO Statement	Knowledge Level
CO1	To introduce the concepts of Data structures and to understand simple linear data structures	K1
CO2	Learn the basics of stack data structure, its implementation and application	K2,K4
CO3	Use the appropriate data structure in context of solution of given problem and demonstrate a familiarity with major data structures.	K3
CO4	To introduce the basic concepts of algorithms	K4
CO5	To give clear idea on algorithmic design paradigms like Dynamic Programming, Backtracking, Branch and Bound	K4

UNIT	CONTENTS	NO. OF SESSIONS
I	**Introduction to Java** - Java History – Java Features – Java and internet Overview of Java Language: Simple Java Program - Java Program Structure - Java Tokens - Java Statements - Java Virtual Machine - Command Line Arguments - Constants, Variables and Data Types.	12
II	**Operators and Expressions, Decision Making Statements, Classes and Objects:** Operators and Expressions - Decision Making and Branching - Decision Making and Looping - Classes, Objects and Methods: Introduction to Class - Defining a Class - Methods Declaration - Creating Objects - Accessing Class Members - Constructors - Method Overloading - Static Members - Nesting of Methods - Inheritance.	12
III	**Introduction To Data Structures:** Data Structures: Definition- Time & Space Complexity Arrays: Representation of arrays, Applications of arrays, sparse matrix and its representation. Linear list: Singly linked list implementation, insertion, deletion and searching operations on linear list Circular linked list: implementation, Double linked list implementation, insertion, deletion and searching operations.	12
IV	**Stacks:** Operations, array and linked representations of stack, stack applications, infix to postfix conversion, postfix expression evaluation, recursion implementation	12
V	**Queues, Trees & Graphs: Queues:** operations on queues, array and linked representations. Circular Queue: operations,, applications of queues. **Trees:** Definitions and Concepts- Representation of binary tree, Binary tree traversals (Inorder, Postorder , preorder). **Graphs:** Representation of Graphs- Types of graphs -Breadth first traversal – Depth first traversal- -Applications of graphs.	12
LEARNING RESOURCES		

TEXT BOOKS	1. Balagurusamy E., "Programming with Java", 6th Edition, McGraw Hill Education Pvt. Ltd., New Delhi, 2019. 2.Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , "Fundamentals of Data in C", Universities Press 3.E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,"Fundamentals of Computer Algorithms " Universities Press
REFERENCE BOOKS	1. Schildt Herbert, "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2018. 2. Paul Deitel, Harvey Deitel., "Java How to Program", 11th Edition, Pearson Education, 2018. 3. Seymour Lipschutz ,"Data Structures with C", First Edition, Schaum's outline series in computers, Tata McGraw Hill. 4. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008. 5. A.K.Sharma, Data Structures using C, Pearson Education India, 2011. G. Brassard and P. Bratley, "Fundamentals of Algorithms", PHI, New Delhi, 1997. 6. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, "The design and analysis of Computer
WEBSITE/ LINK	1.https://www.tutorialspoint.com/data_structures_algorithms/tree_traversal.htm 2.https://www.geeksforgeeks.org/introduction-to-recursion-data-structure-and-algorithm-tutorials/ 3.https://www.geeksforgeeks.org/job-sequencing-problem/ 4.https://www.geeksforgeeks.org/hamiltonian-cycle/

MAPPING WITH PROGRAMME OUTCOMES

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong, M- Medium, L – Low

SUBJECT TITLE	PROGRAMMING IN JAVA LAB	SEMESTER	II
SUBJECT CODE	24U2ITCP02	SPECIALIZATION	NA
TYPE	CORE: PRACTICAL	L:T:P:C	5:0:0:4

List of Experiments

1. Create a Simple Program Using Array in Java.
2. Create a Simple Program Using Java String.
3. Write a Java Program to Create Multi threading.
4. Write a Java Program to handle Exception Handling.
5. Create Event Handling using Mouse.
6. Create Event Handling using Keyboard.
7. Write a Java program for sorting a given list of names in ascending order.
8. Program to demonstrate Applet structure and event handling.
9. Program to demonstrate I/O operations
10. Write a Java program to multiply two given matrices

SUBJECT TITLE	OFFICE AUTOMATION	SEMESTER	II
SUBJECT CODE	23U2CSAC02	SPECIALIZATION	NA
TYPE	AECC : THEORY	L:T:P:C	2:0:0:2

COURSE OBJECTIVE

- To Introduce Students the basic concepts of MS- Office application Word, Excel and PowerPoint.

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the basic concept of MS-Word.	K1
CO2	Explore the concepts of Formatting the Documentation.	K2
CO3	Understanding the basic concept of MS-Excel.	K3
CO4	Apply the concepts of Formulas and Functions in Excel.	K3
CO5	Explore the concepts of Presentation.	K3

Unit	Syllabus Contents	Level	Number of Sessions
I	**Introduction to MS-WORD**: Introduction-starting MS-Word -Creating a new word Document-Saving a word Document-Working with Styles-Applying Bulleted and Numbered List-Using Cut, Copy and Paste - Using Find, Replace and GO TO -Opening and Existing Word Document- Closing a Word Document.	K3	4
II	**Designing a Word Document:** Designing and Reviewing a Word Document: Setting Paragraph Indent and Spacing- Inserting Header and footer – Changing Page Setup Option.	K3	4
III	**Introduction to EXCEL**: Introduction-Creating a New Excel Workbook-Adding Data to Cells- Adding Data using Auto fill-Inserting cells Deleting cells- -Wrapping Text-Changing Formats.	K3	4
IV	**Working with Tables and Charts**: Working with Tables-Working with Charts- Changing the Chart Types-Changing the Chart Layout-Formulas and Functions: Working with Formula- Working with Functions.	K4	4
V	**Introduction to PowerPoint**: Creating a Presentation & Saving Presentation-Basics of a Presentation- Setting Up and Running a Slide Show-Slide Show Setup - Building Dynamic PowerPoint Presentation: Adding and Removing Animation Effects-Adding and Removing Transition Effects.	K3	4

LEARNING RESOURCES	
TEXT BOOKS	1. Kogent Solutions Inc.Office 2007 in Simple Steps – Dream Tech Press 2008 Edition.

REFERENCE BOOKS	1. Learning MS Office 2007 – Ramesh Bangia. 2. Microsoft Office 2007 Training Guide – Prof. Sathish Jain,M.Geetha,Kratia,BPB Publications.
WEB SITES / LINKS	1. **https://support.office.com/en-us/article/training-office-basics.** 2. **https://www.ursaminor.in/course/basics-of-microsoft-office.** 3. **https://support.office.com/en-us/article/training-office-basics.**

MAPPING WITH PROGRAMME OUTCOMES

	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

SUBJECT TITLE	DATABASE MANAGEMENT SYSTEM	SEMESTER	I
SUBJECT CODE	24U3ITC03	SPECIALIZATION	NA
TYPE	CORE: THEORY	L:T:P:C	4:0:0:3

COURSE OBJECTIVE:

1. Understand the basic concepts of database management systems.
2. Apply SQL to find solutions to a broad range of queries.
3. Analyze a given database application scenario to use ER model for conceptual design of the database.
4. Apply normalization techniques to improve database design.
5. Understand the PostgreSQL techniques for database development.

CO No.	CO Statement	Knowledge Level
CO1	Understand the basic concept of DBMS	K1
CO2	Understand the importance SQL and its basic operations	K2,K4
CO3	Understanding the basic concept of relational models.	K3
CO4	Develop skills in designing and modeling databases effectively	K4
CO5	Apply database concepts to real-world scenarios and case studies	K4

UNIT	CONTENTS	NO. OF SESSIONS
I	**Introduction**: Database System Applications – Purpose – View of Data – Data Models – Database Design and Database Engine – Database Architecture – Users and Administrators – Relational Model: Structure of Relational Databases- Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Algebra.	12
II	**SQL**: Introduction to SQL: SQL – Data Definition – Basic Structure – Basic Operations – Set Operations – Null Values and Aggregate Functions – Nested Sub Queries – Modification of Databases.	12
III	**Intermediate SQL and ER modeling**: Join Expressions – Views – Transactions – Integrity Constraints – Triggers – SQL – Data Types and Schemas – Authorization – Database Design and ER Model – ER Diagrams – Complex Attributes – Mapping Cardinalities – Primary Key – Extended ER Features.	12
IV	**Relational Database Design:** Features of Good Relational Designs - Functional Dependency - Atomic Domains and First Normal Form - Second Normal Form - Third Normal Form - Boyce-Codd Normal Form – Multi-valued Dependency and Fourth Normal Form - Join Dependency and Fifth Normal Form.	12
V	**PostgreSQL**: What is Postgres? - A Short History of Postgres - Postgres Architectural Concepts - Starting the Interactive Monitor (psql) - Managing a Database - Advanced Postgres SQL Features : Inheritance - Non-Atomic Values.	12

LEARNING RESOURCES	
TEXT BOOKS	1. Silberschatz Abraham, Korth Henry F., and Sudarshan S., "Database System Concepts", 7th Edition, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2021.(Unit I-IV), Unit V-Online Chapter 32. 2. Bruce Momjian,"PostgreSQL Introduction and Concepts", Addison-esley, 2001.

REFERENCE BOOKS	1. Elmasri Ramez, Navathe Shamkant B, "Fundamentals of Database Systems", 7th Edition, Pearson, 2016. 2. Ramakrishnan Raghu, Gehrke Johannes, "Database Management Systems", 3rd Edition, McGraw Hill Education, 2014.
WEBSITE/LINK	1.https://db-book.com/ 2.https://www.db-book.com/Previous-editions/db4/slide-dir/index.html

MAPPING WITH PROGRAMME OUTCOMES

	PSO1	**PSO2**	**PSO3**	**PSO4**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong, M- Medium, L – Low

SUBJECT TITLE	POSTGRE SQL LAB	SEMESTER	III
SUBJECT CODE	24U3ITCP03	SPECIALIZATION	NA
TYPE	CORE: PRACTICAL	L:T:P:C	3:0:0:2

LIST OF EXPERIMENTS

1. Execute Basic SQL statements for creating and managing tables using DDL.
2. Execute Basic SQL statements for creating and managing tables using DML
3. Execute SQL expressions using SET operations and aggregate functions.
4. Develop SQL expressions using join operations.
5. Execute Triggers in SQL.
6. Postgre SQL Using Create, Alter, Update, Insert Table.
7. Postgre SQL Basic Select Statement.
8. Postgre SQL Sorting the Data.
9. Postgre SQL Aggregate Functions and Group by Functions.
10. Postgre SQL String Functions.

SUBJECT TITLE	MICROSOFT POWER BI	SEMESTER	III
SUBJECT CODE	24U3ITC04	SPECIALIZATION	NA
TYPE	CORE	L:T:P:C	3:0:0:3

COURSE OBJECTIVE

1. Understand basic concepts and terminology of the Power BI service.
2. Find your content in dashboards, reports, and apps.
3. View and export data from dashboards and reports.
4. View filters that are used in a report.
5. Explain the relationship between dashboards and reports, visualizations, and tiles.
6. Display action menus for tiles and details for report visualizations.

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand Power BI concepts like Microsoft Power BI desktop layouts, BI reports, dashboards, and Power BI DAX commands and functions	K1
CO2	Gain a competitive edge in creating customized visuals and deliver a reliable analysis of vast amount of data using Power BI	K2
CO3	Learn how to experiment, fix, prepare and present data quickly and easily	K3
CO4	Create a sales analysis report and a project management report	K4
CO5	Form relationships in your data model and learn data visualization best practices	K4

Unit	Syllabus Contents	Number of Sessions
I	**Introducing Power BI:** Features of Power BI-Building Blocks of Power BI-Power BI tools-Installing the power BI Desktop App. **Connecting to Data Sources:** Getting data from Excel Files: Using Power BI Desktop – Using the Power BI Online Service. Getting data from a SQL server Database.	**12**
II	**Creating Datasets:** Creating A Dataset From A Single Data source- Creating A Dataset From A Multiple Data sources- Refreshing Data In A Dataset	**12**
III	**Data Munging with Power Query:** Transforming, Cleansing, and Filtering Data- Merging Data- Appending Data- Splitting Data- Unpivoting Data-Grouping and Aggregating Data- Inserting Calculated Columns. Creating the Data Model	**12**
IV	**Creating Reports with Power BI Desktop:** Creating Tables and Matrices-Constructing Bar, Column, and Pie Charts- Building Line and Scatter Charts-Creating Map-Based Visualizations- Linking Visualizations in Power BI-Drilling Through Visualizations	**12**
V	**Publishing Reports and Creating Dashboards in the Power BI Portal:** Create a user-friendly model- Publish Power BI Desktop files to the Power BI Service-Add tiles to a dashboard-Share dashboards -Refresh data in published reports.	**12**

LEARNING RESOURCES	
TEXT BOOKS	1.“Beginning Microsoft Power BI” A Practical Guide to Self-Service Data Analytics ,Third Edition ,Dan Clark, Camp Hill, PA, USA, SBN-13 (pbk): 978-1-4842-5619-0 2. “Introduction to Microsoft Power BI” M.O. Cuddley is a Microsoft Certified professional with a Microsoft Certified Solutions Expert (MCSE) certification in Business Intelligence. 3. “Introducting to Microsoft Power BI” PUBLISHED BY Alberto Ferrari and Marco Russo Microsoft Press A division of Microsoft Corporation One Microsoft Way Redmond, Washington. ISBN: 978-1-5093-0228-4
REFERENCE BOOKS	1.”Power BI for Beginners”: A Step-by-Step Training Guide Using Best Practice Methodologies 2020 Theta Systems Limited. 2. Learn Power BI by Greg Deckler A beginner's guide to developing interactive business intelligence solutions using Microsoft Power BI Published by Packt Publishing Ltd. Livery Place 35 Livery Street Birmingham B3 2PB, UK. ISBN 978-1-83864-448-2.
WEB SITES / LINKS	Power BI for Beginners - 2020.pdf (windows.net) Learn Power BI INTRODUCTION TO MICROSOFT POWER BI: BRING YOUR DATA TO LIFE! (projanco.com) powerbi-intro.pdf Microsoft_Press_ebook_Introducing_Power_BI_PDF_mobile (2).pdf ginning Microsoft Power BI, 3rd Edition.pdf

MAPPING WITH PROGRAMME OUTCOMES

	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

SUBJECT TITLE	DATA ANALYTICS	SEMESTER	IV
SUBJECT CODE	24U4ITC05	SPECIALIZATION	NA
TYPE	CORE: THEORY	L:T:P:C	4:0:0:3

COURSE OBJECTIVE:

On successful completion of the course, students will be able to

1. Demonstrate knowledge of Big Data, Data Analytics, challenges and their solutions in Big Data.
2. Analyze Hadoop Framework and eco systems.
3. Analyze MapReduce and Yarn, Work on NoSQL environment.
4. Work on NewSQL environment, MongoDB and Cassandra.
5. Analyze the Kafka framework and concepts.

CO NO.	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To understand the concepts of big data	K1
CO2	To explain the concept of Hadoop components	K2,K4
CO3	To apply the map reduce concepts	K3
CO4	To understand the New SQL	K4
CO5	To explain the concept of Kafka	K4

UNIT	CONTENTS	NO. OF HOURS
I	**Introduction to big data**: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured - Sources of data. Big Data Evolution - Definition of big data-Characteristics and Need of big data-Challenges of big data. Big data analytics, Overview of business intelligence.	12
II	Big data technologies and Databases: Hadoop – Requirement of Hadoop Framework - Design principle of Hadoop –Comparison with other system SQL and RDBMS- Hadoop Components – Architecture -Hadoop 1 vs Hadoop 2.	12
III	MapReduce and YARN framework: Introduction to MapReduce , Processing data with Hadoop using MapReduce, Introduction to YARN, Architecture, Managing Resources and Applications with Hadoop YARN. Big data technologies and Databases: NoSQL: Introduction to NoSQL - Features and Types- Advantages & Disadvantages -Application of NoSQL.	12
IV	New SQL: Overview of New SQL - Comparing SQL, NoSQL and NewSQL. Mongo DB: Introduction – Features – Data types – Mongo DB Query language – CRUD operations – Arrays – Functions: Count – Sort – Limit – Skip – Aggregate – Map Reduce. Cursors – Indexes – Mongo Import – Mongo Export. Cassandra: Introduction – Features – Data types – CQLSH – Key spaces – CRUD operations – Collections – Counter – TTL – Alter commands – Import and Export – Querying System tables.	12
V	**Meet Kafka:** Publish/Subscribe Messaging-Enter Kafka-Why Kafka?- The Data Ecosystem-Kafka's Origin-. **Installing Kafka:** First Things First-Installing a Kafka Broker-Broker Configuration-Hardware Selection-Sending a Message to Kafka	12

LEARNING RESOURCES

TEXT BOOKS	1. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., 2016. 2. Neha Narkhede, Gwen Shapira & Todd Palino," Kafka: The Definitive Guide Real-Time Data and Stream Processing at Scale",O'Relly,First Edition,2017
REFERENCE BOOKS	1. Tom White, "Hadoop: The Definitive Guide", O"Reilly, 4th Edition, 2015. 2. Mohammed Guller, "Big Data Analytics with Spark", Apress, 2015 3. Donald Miner, Adam Shook, "Map Reduce Design Pattern", O"Reilly, 2012
WEBSITE/LINK	1. https://cloud.google.com/pubsub/docs/overview 2. https://www.ibm.com/docs/en/ibm-mq/9.1?topic=overview-publishsubscribe-messaging

MAPPING WITH PROGRAMME OUTCOMES

	PO01	PO02	PO03	PO04	PO05
CO1	S	S	S	-	S
CO2	S	M	M	S	S
CO3	S	L	L	M	S
CO4	M	S	M	S	M
CO5	S	L	S	S	S

S – Strong, M – Medium, L – Low

SUBJECT TITLE	DATA ANALYTICS USING APACHE KAFKA LAB	SEMESTER	IV
SUBJECT CODE	24U4ITCP05	SPECIALIZATION	NA
TYPE	CORE: PRACTICAL	L:T:P:C	3:0:0:3

LIST OF EXPERIMENTS

1. Install and configure Apache Kafka on your local machine or a cloud server.
2. How to create Kafka topics using the command line interface.
3. Write a simple producer script to send messages to a Kafka topic.
4. Use Kafka Streams to perform basic stream processing tasks like word count on a Kafka topic.
5. Experiment with producing and consuming data from Kafka using Python libraries like confluent-kafka or kafka-python.
6. Produce and consume data from Kafka using Java with the Kafka client library.
7. Simulate a broker failure and observe how Kafka maintains data availability and consistency.
8. Create a basic data pipeline using Kafka, where data is produced, processed, and consumed in a simple workflow.

SUBJECT TITLE	R PROGRAMMING LAB	SEMESTER	IV
SUBJECT CODE	24U4ITCP06	SPECIALIZATION	NA
TYPE	CORE: PRACTICAL	L:T:P:C	3:0:0:2

LIST OF EXPERIMENTS

1. Download and install R-Programming environment and installbasic packages using install .packages () command in R.
2. Learn all the basics of R-Programming (Data types, VariablesOperators etc.)
3. Implement R-Loops with different examples.
4. Learn the basic of functions in R and implement with examples.
5. Implement data frames in R. Write a program to join columns and rows in a data frame using c bind()and r bind() in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R (Vectors, Lists, DataFrames).
8. Write a program to read a csv file and analyze the data in the file in R.
9. Create pie charts and bar charts using R.
10. Create a data set and do statistical analysis on the data using R.
11. Write R program to find Correlation and Covariance.
12. Write R program for Regression Modeling.
13. Write R program to build classification model using KNNalgorithm.
14. Write R program to build clustering model using K-mean algorithm.

SEMESTER V

Subject Title	ARTIFICIAL INTELLIGENCE USING PYTHON	Semester	V
Subject Code	24U5ITC06	Specialization	CA
Type	Core: Theory	L:T:P:C	5:0:0:4

Course objective:

1. To introduce the artificial intelligence (AI) techniques to solve problems and search strategies to find optimal solution paths from start to goal state.
2. To introduces Python programing for solving AI problems.
3. To introduce the AI Agents their design, planning and learning techniques.
4. To introduce the basic data mining and visualization techniques.

CO No.	CO Statement	Knowledge Level
CO1	Understand fundamental AI concepts and identify a range of symbolic and non-symbolic AI techniques.	K1
CO2	Demonstrate an understanding of various AI algorithms	K2,K4
CO3	Use different ML techniques used in AI Applications.	K3
CO4	Demonstrate an understanding of Statistical function used in AI	K4
CO5	Identify problems where artificial intelligence techniques are applicable	K4

Unit	Contents	No. of Sessions
I	**Python Overview**: Data Types, Expressions Python programming - variable, Data type, Keywords, Literals, Operator, Expression, type conversion, Comments, input and output, Strings, Assignment and Comments - Numeric Data Types and Character Sets, Expressions.	12
II	**FUNCTIONS AND MODULES:** Calling Functions,- Iteration - for loop - Selection - Boolean Type, Comparisons, and Boolean Expressions, if-else Statements, Strings and Text Files: Strings-Accessing Characters and Substrings in Strings- Text Files-Text Files and Format - Writing Text to a File - Writing Numbers to a File -Reading Text from a File.	12
III	**Introduction to Artificial Intelligence**: Introduction – Need of AI – Branches of AI - Making machines think like humans - General Problem Solver - Building an intelligent agent - Types of models - Installing Python 3 - Installing on Ubuntu - Installing on Windows. **Fundamental Use Cases for Artificial Intelligence**: Representative AI use cases - Digital personal assistants and chatbots - Personal chauffeur - Uber ATG - Shipping and warehouse management - Human health.	12
IV	**Chatbots:** The future of chatbots - Chatbots - Chatbot concepts - A well-architected chatbot - Chatbot platforms - Creating a chatbot using DialogFlow - DialogFlow setup - Integrating a chatbot into a website using Python - How to set up a webhook in DialogFlow - Enabling webhooks for intents - Setting up training phrases for an intent - Setting up parameters and actions for an intent - Building fulfillment responses from a webhook - Checking responses from a webhook.	12
V	**Building Recommender Systems:** Extracting the nearest neighbors-Building a K-nearest neighbors classifier-Computing similarity scores-Finding similar users using collaborative filtering - Building a movie recommendation system. **Heuristic Search Techniques:** Introduction-Uninformed versus informed search-Constraint satisfaction problems-Local search techniques-Simulated annealing-Constructing a string using greedy search-Solving a problem with constraints-Solving the region-coloring problem-Building an 8-puzzle solver.	12

Learning Resources	
Text Books	1. Kenneth A. Lambert, Martin Osborne, "Fundamentals of Python: First Programs, Cengage Learning", second edition, 2018 2. Artificial Intelligence with Python - Second Edition - Alberto ArtasanchezPrateek Joshi. 3. Artificial Intelligence Programming with Python: From Zero to Hero,Perry Xiao published by Wiley
Reference Books	1. Artificial Intelligence with Python - Second Edition - Alberto Artasanchez (Author), Prateek Joshi (Author). 2. AI and Machine Learning for Coders: A Programmer's Guide to Artificial Intelligence 1st Edition by Laurence Moroney (Author).
Website/Link	1. AI-with-Python.pdf 2. AI with Python (tutorialspoint.com) 3. AI With Python Tutorial - GeeksforGeeks 4. Lecture 0 - CS50's Introduction to Artificial Intelligence with Python (harvard.edu)

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04
CO1	**S**	**M**	**S**	**S**
CO2	**S**	**M**	**M**	**S**
CO3	**S**	**M**	**M**	**M**
CO4	**S**	**M**	**H**	**M**
CO5	**M**	**S**	**M**	**M**

S-Strong , M- Medium , L – Low

SubjectTitle	AI UING PYTHON LAB	Semester	V
SubjectCode	24U5ITCP07	Specialization	NA
Type	Core: Practical	L:T:P:C	0:0:4:3

LIST OF EXPERIMENTS

1. Write a python program using Control statements
2. Write a python program using Functions and String Operations
3. Write a python program using Text Files
4. Write a Program to Implement Breadth First Search using Python.
5. Write a Program to Implement Depth First Search using Python.
6. Write a program to implement 8 puzzle problem.
7. Write a program to implement Tic-Tac-Toe game using python.
8. Write a python program to implement simple Chatbot?
9. Write a python program to implement Water Jug Problem.
10. Write a program to implement Hill Climbing Algorithm

Subject Title	Microsoft Azure Fundamental AI 900 Lab	Semester	III
Subject Code	24U5ITCP08	Specialization	NA
Type	Core: Practical	L:T:P:C	0:0:5:4

List of Experiments	
1	Deploy and test various Azure Cognitive Services such as Computer Vision, Speech, and Language Understanding.
2	Utilize Azure Text Analytics to perform sentiment analysis on a given dataset of text documents.
3	Train a custom image classification model using Azure Custom Vision and evaluate its performance.
4	Build a simple speech recognition application using Azure Speech Services.
5	Develop a language translation application using Azure Translator Text API to translate text between multiple languages.
6	Create a basic chatbot using Azure Bot Service and integrate it with various channels like Teams or Web Chat.
7	Implement an anomaly detection system using Azure Anomaly Detector API on a time-series dataset.
8	Build a recommendation system using Azure Personalizer to provide personalized recommendations to users.
9	Use Azure Text Analytics Named Entity Recognition to identify and classify entities in a given text.
10	Develop a face recognition system using Azure Face API to detect and identify faces in images or video streams.

SEMESTER VI

Subject Title	UI Path - Automation RPA	Semester	VI
Subject Code	24U6ITC07	Specialization	NA
Type	Core: Theory	L:T:P:C	5:0:0:4

Course objective:

- To understand basic concepts of RPA.
- To describe IIPA, where it can be applied and how it implemented.
- To describe the different types of variables, Control Flow and data manipulation techniques.
- To understand Image, Text and Data Tables Automation.
- To describe various types of Exceptions and strategies to handle.

CO No.	CO Statement	Knowledge Level
CO1	Understand the basic concepts of RPA	K1
CO2	Describe various components and platforms of RPA	K2
CO3	To Describe the different types of variables, control flow and data manipulation techniques.	K3
CO4	Understand various control techniques and OCR in RPA.	K4
CO5	To Describe various types and strategies to handle exception.	K4

Unit	Contents	No. of Sessions
I	**RPA Foundations:** What is RPA – Irlavors of RPA – History of RPA – The Benefits of RPA – The down sides of RPA - RPA Compared to BPO, BPM and BPA - Consumer Willingness for Automation - The Workforce of the Future – RPA Skills – On – Premise Vs. the Cloud – Web Technology – Programming Languages and Low Code – OCR – Databases – Apls – Al – Cognitive Automation – Agile, Scrum , Kanban and Waterfall Devops -Flowcharts.	12
II	**RPA Platforms :** Components of RPA- RPA Platforms-About Ui Path- About 0B UiPath - The future of automation - Record and Play – Downloading and installing UiPath Studio -Learning Ui Path Studio - Task recorder - Step-by step examples using the recorder.	12
III	Sequence, Flowchart, and Control Flow – sequencing the workflow – Activities – Control flow, various types of loops, and decision making -Step-by step example using Sequence and Flowchart – Step - by step example using Sequence and Control flow – Data Manipulation – Variables and Scope Collections - Arguments - Purpose and use- Data table usage with examples Clipboard management – File operation with step – by – step example -CSV/ Excel to data table and vice versa (with a step-by-step example).	12
IV	Taking Control of the Controls- Finding and attaching windows- Finding the control- Techniques forwaiting for a control- Act on controls - mouse and keyboard activities- Working with Ui Explorer-Handling events – Revisit recorder – Screen Scraping –When to use OCR-Types of OCR available – How to use OCR - Avoiding typical failure points.	12

V	Exception Handling, Debugging, and Logging- Exception handling- Common exceptions and ways to handle them- Logging and taking screenshots Debugging techniques- Collecting crash dumps- Error reporting – Future of RPA.	**12**

Learning Resources	
Text Books	1. Tom I'aulli, The Robotic Process Automationl land book : A Guide to Implementing RPA Systems ,2020 ,lSBN-13 (electronic) : 978-7-4842-5729-6, Publisher : Apress. 2. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher : Packt Publishing Release Date : March 2018 ISBN:9787788470940.
Reference Books	1. Frank Casale, Rebecca Dilla, IieidiJaynes, Lauren Living ston, "lntroduction to Robotic Process Automation : a Primer", Institute of Robotic Process Automation. 2. Richard Murdoch, I {obotic Process Automation : Guide' Io Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant 3. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits : Understanding RPA and Intelligent Automation.
Website/Link	1. https:/fivrvw.rripatl:.r:onr/r'pa/;'ol;otic-pl'occss-ailtt:r'r:irtiou

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	UI Path Automation RPA Lab	Semester	VI
Subject Code	24U6ITCP09	Specialization	NA
Type	Core: Lab	L:T:P:C	0:0:4:3

Course Outcomes:

At the end of the Course the student shall be able to

CO1:Implement basic operations on different data types. (L3)

CO2: Apply Arithmetic operations different fields from an excel file (L3)

CO3:Validate different formats for input and output validations.(L3)

CO4: Develop Bots for web scraping Applications. (L3)

CO5:Develop bots for real time automation applications with different file formats.(L3)

CO No.	CO Statement	Knowledge Level
CO1	Implement basic operations on different data types	K1
CO2	Apply Arithmetic operations different fields from an excel file	K2
CO3	Validate different formats for input and output validations	K3
CO4	Develop Bots for web scraping Applications	K4
CO5	Develop bots for real time automation applications with different file formats	K4

LIST OF EXPERIMENTS:

1. Download, Install and Activate Ui-Path Studio. Learn all the basics of RPA(Variables ,arguments and Control flow etc.)
2. Write a program to
   i) empty the trash folder in Gmail
   ii) empty the Recycle Bin
3. Write a program to perform if-activity, switch-activity.

(Suggested Hint: Find the smallest and biggest numbers in an array.)

4. Write a program to perform while activity, do-while activity, for-each activity.(SuggestedHint:howanintegervariablewillincreasefrom5to50inincrementsof5.)
5. Write a program to perform Flowchart and Sequence activity on Scalar variables.
6. Write a program to perform Flowchart and Sequence activity on Collection variables.
7. Write a program to
   i)build a data table(static)
   ii) build a data table using data scraping(Dynamically)
8. Writeaprogramtocreateasimplecalculatorusingaseparateworkflowandarguments
9. Write a program for clip board management.

(Suggested Hint: open Notepad, write some data into it, and then copy the data to the clipboard. Later extract the data from the clipboard)

10. Write a program to perform the following operations on an Excel file:
    i)Read cell
    ii)Write cell

iii)Read range
iv)Write range
v)Append range

11. Write a program to implement Arithmetic operations in 2 Excel files.
12. Write a program to read an Excel file and creating a data table by using data from the Excel file.
13. Write a program for acting on controls using mouse and keyboard activities.
14. Write a program for screen scraping using OCR
15. Write a program to extract Email Address

Subject Title	Introduction to Deep Learning	Semester	VI
Subject Code	24U6ITC08	Specialization	NA
Type	Core: Theory	L:T:P:C	5:0:0:4

Course objective:

- Describe the feed-forward and deep networks.
- Design single and multi-layer feed-forward deep networks and tune various hyper-parameters.
- Implement deep neural networks to solve a problem and analyze performance of deep networks.
- Use pre-trained models to solve a problem.
- Be able to re-train and tune hyperparameters of several classes of deep learning methods, in particular CNNs, RNNs, and GANs, on real-world datasets.
- Be able to extract patterns from complex real world image and text datasets by using deep learning methods.

CO No.	CO Statement	Knowledge Level
CO1	Understand the basic concepts of RPA	K1
CO2	Describe various components and platforms of RPA	K2
CO3	To Describe the different types of variables, control flow and data manipulation techniques.	K3
CO4	Understand various control techniques and OCR in RPA.	K4
CO5	To Describe various types and strategies to handle exception.	K4

Unit	Contents	No. of Sessions
I	**Introduction to neural networks**: Artificial neurons, perceptron, computational models of neurons, Structure of neural networks, Multilayer feedforward neural networks (MLFFNN), Backpropagation learning, Empirical risk minimization, bias-variance tradeoff, Regularization, output units: linear, softmax , hidden units:tanh, RELU	12
II	**Deep neural networks**: Difficulty of training DNNs, Greedy layerwise training, Optimization for training DNN's, Newer optimization methods for neural networks(AdaGrad, RMSProp, Adam), Regularization methods(dropout, drop connect, batch normalization).	12
III	Convolution neural networks (CNNs): Introduction to CNN - convolution, pooling, Deep CNNs - LeNet, AlexNet. Training CNNs, weights initialization, batch normalization, hyperparameter optimization, Understanding and visualizing CNNs, Using a pre trained convnet	12
IV	Recurrent neural networks (RNNs): Sequence modeling using RNNs, Back propagation through time, Long Short Term Memory (LSTM), Bidirectional RNN, Bidirectional LSTM	12
V	**Unsupervised deep learning:** Auto encoders, Generative Adversarial Networks. **Applications:** Computer vision, Speech recognition and NLP.	12

Learning Resources	
Text Books	1. Ian Goodfellow, Yodhua Bengio and Aaron Courville, *Deep Learning,* MIT Press Book**,** 2016. 2. Francois Chollet, *Deep Learning with python, 2nd edition*, Meaning Publications Co, 2021.
Reference Books	1. Bunduma, N., *Fundamentals of Deep Learning*, 1st edition, O'reilly Books, 2017. 2. Heaton, J., *Deep Learning and Neural Networks*, 1st edition, Heaton Research Inc., 2015.
Website/Link	1. https://github.com/lijqhs/deeplearning-notes

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong, M- Medium, L – Low

DISCIPLINE ELECTIVE

Subject Title	CRYPTOGRAPHY AND NETWORK SECURITY	Semester	VI
Subject Code	24U3ITDE01	Specialization	CA
Type	Elective: Theory	L:T:P:C	4:0:0:3

Course objective:

- To understand basics of Cryptography and Network Security.
- To be able to secure a message over insecure channel by various means.
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To understand various protocols for network security to protect against the threats in the networks

CO No.	CO Statement	Knowledge Level
CO1	Explain the various security aspects and its importance	K1
CO2	Outline the several types of security attacks and various cryptographic algorithms	K1,k2
CO3	Summarize about message authentication and security practices.	K2,k3
CO4	Apply symmetric key and public key cryptographic algorithms to perform the process of cryptography.	K4
CO5	Analyze the various cryptographic algorithms and apply them accordingly	K4,k5

Unit	Contents	No. of Hours
I	Computer security concepts-The OSI Security Architecture- Security attacks-security services-Security Mechanisms – A model for Network Security. Classical Encryption Techniques: Symmetric Cipher model.	12
II	Block Ciphers and the Data Encryption Standard: Block cipher Principles-The Data Encryption Standard-A Des Example- Strength of DES – Block cipher design principles.	12
III	ASYMMETRIC KEY CIPHERS: Primes – Primality Testing-Fermat's and Euler's Theorem - Public key Cryptography and RSA: Principles of public key crypto systems. RSA Algorithm.	12
IV	Data Integrity Algorithms: Simple Hash function – Security of hash function – SHA. Authentication requirement – Authentication function – MAC. Digital signature and authentication protocols – DSS- user Authentication.	12
V	SECURITY PRACTICE AND SYSTEM SECURITY: Electronic Mail security – PGP, S/MIME – IP security .SYSTEM SECURITY: Intruders – Malicious software – Firewalls.	12

Learning Resources	
Text Books	1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI3rd Edition, 2006.
Reference Books	2. BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007. 3. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and NetworkSecurity, Wiley India Pvt.Ltd
Website/Link	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview https://onlinecourses.swayam2.ac.in/arp19_ap79/preview

Mapping with Programme Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	S	S	M
CO2	L	L	S	S	M
CO3	S	S	S	S	L
CO4	S	S	S	M	L
CO5	L	L	S	M	L

S – Strong, M – Medium, L – Low

Subject Title	FUNDAMENTALS OF ARTIFICIAL INTELIGENCE	Semester	III
Subject Code	24U3ITDE02	Specialization	CA
Type	Elective : Theory	L:T:P:C	4:0:0:3

Course objective:

1. Study the concepts of Artificial Intelligence.
2. Learn the methods of solving problems using Artificial Intelligence.
3. Learn the knowledge representation techniques, reasoning techniques and planning
4. Introduce the concepts of Expert Systems and machine learning.

CO No.	CO Statement	Knowledge Level
CO1	Understand the informed and uninformed problem types and apply search strategies to solve them.	K1
CO2	Apply difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing	K2,K4
CO3	Design and evaluate intelligent expert models for perception and prediction from intelligent environment.	K3
CO4	Formulate valid solutions for problems involving uncertain inputs or outcomes by using decision making techniques.	K4
CO5	Demonstrate and enrich knowledge to select and apply AI tools to synthesize information and develop models within constraints of application area.	K4

Unit	Contents	No. of Sessions
I	Basics of Artificial Intelligence : What is Artificial Intelligence- The AI Problem- The Underlying Assumption- AI Techniques- The level of the Model- criteria for success- Defining the Problem as a State Space Search- Production System- Problem Characteristics.	12
II	Heuristic Search Techniques: Issues in Design of Search Programs- Generate and Test- Hill climbing- Best-first search- Problem Reduction- Constraint satisfaction- Mean-ends Analysis	12
III	Knowledge Representation: Representation and Mappings- Approaches to knowledge representation- Issues in Knowledge Representation - Procedural Versus Declarative Knowledge- - Logic Programming -Forward Versus Back wand Reasoning-Matching,	12
IV	Symbolic and Statistical Reasoning: Introduction to Non monotonic Reasoning - Logics for Non monotonic Reasoning-Implementation Issues -Probability and Bayes Theorem-Certainty Factors and Rule-based Systems-Bayesian Networks-Dumpster-Shafer Theory.	12
V	Game Playing, Planning, Understanding: The Minimax Search Procedure-Adding Alpha beta cut-off-Additional Refinement-Planning Overview, components of planning system-Nonlinear Planning Using Constraint Posting -Hierarchical Planning and Reactive System-What is Understanding-What Makes Understanding Hard-Understanding as Constraint Satisfaction.	12

Learning Resources	
Text Books	1. Artificial Intelligence by Elaine Rich, Kevin Knight and Shivashankar B Nair
Reference Books	1. Artificial Intelligence: A Guide to Intelligent Systems" by Michael Negnevitsky 2. "Artificial Intelligence: Structures and Strategies for Complex Problem Solving" by George F. Luger 3. Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth.
Website/Link	1. https://stanford-cs221.github.io/autumn2020/ 2.https://intellipaat.com/blog/tutorial/artificial-intelligence-tutorial/ 3. https://www.edureka.co/blog/knowledge-representation-in-ai/ 4. https://www.brainkart.com/article/Symbolic-Reasoning_8586/ 5.https://www.geeksforgeeks.org/game-playing-in-artificial-intelligence/

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	OPERATING SYSTEMS	Semester	III
Subject Code	24U3ITDE03	Specialization	CA
Type	Elective : Theory	L:T:P:C	4:0:0:3

Course objective:

1. To introduce students with basic concepts of Operating System, its functions and services.
2. To familiarizethe students with various views and management policies adopted by O.S.
3. Pertaining with processes, Deadlock, Memory, File and I/O operations

CO No.	CO Statement	Knowledge Level
CO1	Analyze the structure of OS and basic architectural components involved in OS design	K1
CO2	Analyze and design the applications to run in parallel either using process or thread models of different OS	K2,K4
CO3	Organize the various device and resource management techniques for time sharing and distributed systems	K3
CO4	Explain the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system	K4
CO5	Interpret the mechanisms adopted for file sharing in distributed Applications	K4

Unit	Contents	No. of Sessions
I	Operating System Objectives and Functions. History of Operating System: First, Second, Third & Fourth Generation Operating System. Types of Operating System: Main Frame - Server - Multiprocessor -Personal Computer - Embedded - Real-Time Operating System. The Evolution of Operating System	12
II	Threads: Process and Threads - Multithreading - Thread Functionality - Mutual Exclusion and Synchronization: Principles of Concurrency - Mutual Exclusion - Semaphores. Deadlock and Starvation: Resources - Principles of Deadlock - Deadlock Detection and Recovery - Deadlock Avoidance and Prevention.	12
III	Memory Management Requirements - Memory Partitioning - Paging - Segmentation. Virtual Memory: Hardware and Control Structures. Operating System Software: Fetch Policy - Placement Policy -Replacement Policy - Basic Algorithms - Page Buffering.	12
IV	Types of Scheduling: Long Term Scheduling - Medium Term Scheduling - Short-Term Scheduling. Scheduling Algorithm: Short Term Scheduling Criteria - The Use of Priorities - Alternative Scheduling Policies. File Management: Overview - File Organization and Access - File Sharing - Record Blocking - Secondary Storage Management.	12

V	The Evolution of the I/O function-Direct Memory Access. I/O Buffering: Single Buffer-Double Buffer-Circular Buffer-The Utilities of Buffering. Disk Scheduling: Disk Performance Parameters-Disk Scheduling Polices-RAID. Case Study: Windows OS, Linux OS, and MAC OS	**12**

Learning Resources	
Text Books	Operating Systems Internals and Design Principles" by William Stallings, Second Edition, PHI Learning Private Limited, New Delhi, 2012.
Reference Books	Modern Operating Systems" by Andrew S. Tanenbaum, Third Edition, PHI Learning Private Limited, NewDelhi, 2011.
Website/Link	http://faculty.salina.k-state.edu/tim/ossg/Introduction/OSrole.html

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	DATA SCIENCE USING R PROGRAMMING	Semester	IV
Subject Code	24U4ITDE04	Specialization	CA
Type	Elective : Theory	L:T:P:C	4:0:0:3

COURSE OBJECTIVES:

1. Knowledge of basic nature of data.
2. To Extract the useful information from Data.
3. Understanding of represent of data into meaningful information.
4. Understanding some basics of statistics.
5. How to handle tolerance in the Data.

CO No.	CO Statement	Knowledge Level
CO1	**Understand and critically assess available data using machine learning methods**	K1
CO2	**Learn the basic concepts and techniques of Data Science and discover trends in both structured and unstructured data.**	K2,K4
CO3	**Understand the concepts of supervised and unsupervised Learning.**	K3
CO4	**Analyze complex problems using advanced analytics tools.**	K4
CO5	**Use of large volume data by extracting useful information and patterns and provide predictive insights.**	K4

Unit	Contents	No. of Sessions
I	**INTRODUCTION TO DATA SCIENCE AND MACHINE LEARNING** Defining a Data Scientist - Importance of Data Science - Data Science Life Cycle - Data Science Components - Applications of Data Science - Introduction to Artificial Intelligence - Data Science and Machine Learning - Data Analytics and Machine Learning - The Future of Machine Learning.	12
II	**THE DATA SCIENCE PROCESS** Overview of Data Science process - Defining a Research goals and Creating a Project Charter - Retrieving data - Cleansing,intergrating and Transforming Data - Exploratory data analysis - Presenting findings and Building applications on top of them.	12
III	**INTRODUCTION TO R** The R Environment - History of R - Features of R - Importance of R - Advantages and Disadvantages of R - Installing R Studio - Simple R Program - The R Script File - operators in R - Variables in R - R Data Structures.	12
IV	**DECISION CONTROL , LOOPING STATEMENTS AND FUNCTIONS Decision Control Statements:** The If Statement - The if…else Statement - The if…else Ladder - **Basic Loop Structures/Iterative Statements:** While Loop - for Loop - Nested Loops - Break Statements - Next Statements - Repeat Loop - Switch Statements - R Functions.	12
V	**GENERATING AND MANIPULATING DATA AND PACKAGES IN R** Generating Random Numbers in R - Reading and Writing Data into Files - Binary Formats in R - Working With Files and Directories - Writing a Data Farmae to File - Reading Data From Excel - R Bulit in Functions - Introduction to R Packages - dplyr and tidyr Packages .	12

Learning Resources	
Text Books	1. Data Science and Machine Learning With R, Reema Thareja , McGraw Hill Education (India) Private Limited. 2. Introduction to Data Science , Davy Cielen,Arno D.B.Meysman and mohamed Ali Published by Dreamtech Press.
Reference Books	1. R Programming for Data Science, Roger D.Peng.
Website/Link	https://www.tutorialspoint.com/r/index.htm https://www.javatpoint.com/r-tutorial https://www.geeksforgeeks.org/r-tutorial/

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject title	INTERNET OF THINGS	Semester	IV
Subject code	24U4ITDE05	Specialization	CA
Type	ELECTIVE: THEORY	L:T:P:C	4:0:0:3

COURSE OBJECTIVE:

- To know about the IoT concepts.
- To understand the development of Internet of Things prototypes.
- To understand the concepts of sensing, actuation and communications.
- Students will be explored to the interconnection and integration of the physical and the cyber space.

CO No.	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Comprehend the essentials of IoT and its applications	K1
CO2	Analyze and understand the various IoT data link and network layer protocols.	K2,K4
CO3	Understand the concepts of IoT Architecture Reference model and IoT reference architecture.	K3
CO4	Demonstrate the operation of processing unit.	K4
CO5	Recognize the operation of parallel processing.	K4

UNIT	CONTENTS	NO.OF. SESSIONS
I	Introduction: Introduction to IoT , Pysical Design of IoT,Logical Design of IoT, IoT enabling Technologies,IoT Level& Deployment Templates. Domain Specifics of Iot, Home automation, cities, Environment, Energy, Retails, Logistics, Agriculture, Industry, Health and Life style .	12
II	IoT and M2M - Difference between IoT and M2M,SDN and NFV for IOT. IOT system management eith NETCONF – YANG- Need for IoT system management, SNMP, Network operator environment, NETCONF,YANG.	12
III	Developing Internet of Things: IOT platforms design Methodology, Introduction, IoT Design Methodology, Case Study on IoT system on Weather Monitoring. IoT systems logical design using Python, Introduction, Installing Python, Python Data types and Data Structures, Control Flow, Functions, Modules.	12
IV	Packages, File Handling, Date time operations, Classes, Python Packages of interest for IoT. Iot physical devices and end points, What is an IoT Device, Exemplary device: Raspberry PI, about the board, Linux on Raspberry PI, Raspberry PI interfaces, other IoT devices.	12
V	Data analytics for IoT- Introduction, Apache Hadoop, Hadoop map reduce for batch data analysis. Csae studies – Illustrating IoT design – Introduction, Home automation, Cities, environment, Agriculture.	12

Learning resources

Text books	1. Internet of Things - A Hands on Approach, Arsdeep Bahga & Vijay Mandisetti, 2015, ISBN : 9788173719547.
Reference books	1. Building the Internet of Things: Implement New Business Models, Disrupt, Maciej Kranz, Willey Publications, 2016 2. Designing the Internet of Things By Adrian McEwen, Hakim Cassimally, Willey Publications 2015.
Website/link	1. http://internetofthingsagenda.techtarget.com/ 2. http://www.businessinsider.com/what-is-the-internet-of-things

MAPPING WITH PROGRAMME OUTCOMES

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	M
CO2	S	M	S	S
CO3	S	S	S	S
CO4	S	S	M	S
CO5	S	S	M	L

S-Strong , M- Medium , L – Low

Subject Title	PERVASIVE COMPUTING	Semester	IV
Subject Code	24U4ITDE06	Specialization	CA
Type	Elective: Theory	L:T:P:C	4:0:0:3

Course objective:

1. To introduce the characteristics, basic concepts and systems issues in pervasive computing.
2. To illustrate smart devices and architectures in pervasive computing.
3. To introduce intelligent systems and interactions in Pervasive computing.
4. To identify the trends and latest development of the technologies in the area.
5. To Understand Interaction Design – HCI and Wearable Computing Environment.
6. To identify Security Challenges & Ethics in Pervasive Computing

CO No.	CO Statement	Knowledge Level
CO1	Demonstrate fundamental concepts in pervasive computing	K1
CO2	Explain pervasive devices and decide appropriate one as per the need of real time applications	K2,K4
CO3	Classify and analyze context aware systems for their efficiency in different ICT systems.	K3
CO4	Illustrate intelligent systems and generic intelligent interactive applications.	K4
CO5	Design HCI systems in pervasive computing environment.	K4

Unit	Contents	No. of Sessions
I	**Introduction To Pervasive Computing:** History, Principles, Characteristics, Problems/Issues & Challenges, Advantages of Pervasive Computing Pervasive Computing Applications: Pervasive computing devices and interfaces, Device technology trends, Connecting issues and protocols.	12
II	**Smart Computing with Pervasive Computing Devices:** Smart Devices: CCI, Smart Environment: CPI and CCI, Smart Devices: iHCI and HPI, Wearable devices, Application and Requirements, Device Technology and Connectivity, PDA Device characteristics - PDA Based Access Architecture, Voice Enabling Pervasive Computing: Voice Standards, Speech Applications in Pervasive Computing.	12
III	**Context Aware Systems:** Introduction, Types of Context, Context Aware Computing and Applications, Modelling Context-Aware Systems, Mobility awareness, spatial awareness, temporal awareness: Coordinating and scheduling, ICT system awareness, Middleware Support	12
IV	**Intelligent Systems and Interaction :** Introduction, Basic Concepts, IS Architectures, Semantic KBIS, Classical Logic IS, Soft Computing IS Models, IS System Operations, Interaction Multiplicity, IS Interaction Design, Generic Intelligent Interaction Applications.	12
V	**Security issues in Pervasive Computing:** security model, authentication & authorization, access control, secure resource discovery, open issues.Pervasive computing security challenges & requirements: Privacy & trust issues, social & user interaction issues, solution for pervasive computing challenges, Role of Ethics in pervasive computing security: Autonomy and Self determination, Responsibility: legal, moral & social, distributive justice, digital divide and sustainable development	12

Learning Resources	
Text Books	1. Stefan Poslad, "Ubiquitous Computing: Smart Devices: Environments and Interactions", Wiley Publication, Student Edition, ISBN 9788126527335. 2. Jochen Burkhardt, Horst Henn, Stefan Hepper, Klaus Rindtroff, Thomas Schack, " Pervasive Computing: Technology and Architecture of Mobile Internet Applications", Pearson Education, ISBN 9788177582802 3. Frank Adelstein, Sandeep K. S. Gupta, Golden G. Richard III, Loren Schwiebert, "Fundamentals of Mobile and Pervasive Computing" McGraw Hill Education, Indian Edition, ISBN 9780070603646
Reference Books	1. Sen Loke, "Context Aware Pervasive Systems; Architectures for new Breed of applications",Taylor and Fransis, ISBN 0-8493-7255-0 2. LaurnceYang, Evi Syukur, Seng Loke, "Handbook on Mobile and Ubiquitous Computing : Status and Perspective‖", CRC Press, 2013 ISBN 978-1-4398-4811-1 3. M. Haque and S. I. Ahamed, "Security in pervasive computing: Current status and open issues", Int. J. Netw. Secur., vol. 3, no. 3, pp. 203–214, 2006
Website/Link	1. M. Hilty, ―Ubiquitous Computing in the Workplace: What Ethical Issues?‖ no. August, pp. 1–16, 2014, [Online].http://link.springer.com/bookseries/11156L. 2.https://web.uettaxila.edu.pk/CMS/SP2014/teMPCms/tutorial%5CFundamentalsOfMobilePervasiveComputing.pdf 3.http://pervasivecomputing.se/M7012E_2014/material/Wiley.Ubiquitous.Computing.Smart.Devices.Environments.And.Interactions.May.2009.eBook.pdf 4.http://media.techtarget.com/searchMobileComputing/downloads/Mobile_and_pervasive_computing_Ch06.pdf

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject title	Microsoft Azure AI Fundamental AI 900	Semester	V
Subject code	23U5ITDE07	Specialization	CA
Type	Elective: Theory	L:T:P:C	5:0:0:4

COURSE OBJECTIVE:

- Describe considerations for fairness in an AI solution
- Describe considerations for reliability and safety in an AI solution
- Describe considerations for privacy and security in an AI solution
- Describe considerations for inclusiveness in an AI solution
- Describe considerations for transparency in an AI solution

CO No.	CO STATEMENT	Knowledge Level
CO1	Describe Artificial Intelligence workloads and considerations	K1
CO2	Describe fundamental principles of machine learning on Azure	K2,K3
CO3	Describe features of computer vision workloads on Azure	K3,k4
CO4	Describe features of Natural Language Processing (NLP) workloads on Azure	K4
CO5	Describe features of conversational AI workloads on Azure	K4

UNIT	CONTENTS	NO. OF SESSIONS
I	**Introduction**, **Getting started with Microsoft Azure** :- What is Azure? - The new world: Azure Resource Manager - Role-Based Access Control - Subscription management and billing - Azure documentation and samples. **Azure App Service and Web Apps**:- App Service and App Service plans - Creating and deploying Web Apps - Configuring, scaling, and monitoring Web Apps.	12
II	**Azure Virtual Machines**:- What is Azure Virtual Machines? - Virtual machine models - Virtual machine components - Create virtual machines - Connecting to a virtual machine - Configuring and managing a virtual machine - Scaling Azure Virtual Machines.	12
III	**Azure Storage**:- Storage accounts - Storage services – Redundancy - Security and Azure Storage - Creating and managing storage.	12
IV	**Azure Virtual Networks**:- What is a virtual network (VNet)? - Network Security Groups - Cross-premises connection options - Point-to-site network.	12
V	**Databases**: - Azure SQL Database - Applications connecting to SQL Database - SQL Server in Azure Virtual Machines - Comparing SQL Database with SQL Server in Azure Virtual Machines - Database alternatives.	12

Learning Resources	
Text books	• Michael Collier and Robin Shahan, "Fundamentals of Azure", 2nd Edition, Microsoft Azure Essential, 2016.
Website/link	1. https://learn.microsoft.com/en-us/training/modules/get-started-ai-fundamentals/ 2. https://learn.microsoft.com/en-us/azure-data-studio/quickstart-sql-database?toc=%2Fazure%2Fazure-sql%2Ftoc.json 3. https://github.com/alfredodeza/ai-fundamentals/blob/main/1-get-started-with-ai.md

MAPPING WITH PROGRAMME OUTCOMES

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject title	QUANTUM COMPUTING	Semester	V
Subject code	24U5ITDE08	Specialization	CA
Type	Elective: Theory	L:T:P:C	5:0:0:4

COURSE OBJECTIVE:

- To understand the basic principles of quantum mechanics.
- Quantum physics and computation.
- Goal of understanding basic quantum algorithms and analyzing them.
- Also addresses limitations of quantum algorithms and introduces the necessary tools.

CO No.	CO Statement	Knowledge Level
CO1	To understand quantum information processing	K1
CO2	Prove basic facts about quantum information channels	K2,K4
CO3	Analyze the behavior of basic quantum algorithms	K3
CO4	Implement simple quantum algorithms and information channels in the quantum circuit model	K4
CO5	Understand Error correction and fault-tolerant quantum computing.	K4

UNIT	CONTENTS	NO. OF SESSIONS
I	**Introduction :** Overview of Traditional Computing : Circuit Model of Computation – Reversible Computation – Quantum Physics – Quantum Physics and Computation – Dirac Notation And Hilbert Spaces – Dual Vectors – Operators – The Spectral Theorem – Functions of Operators – Tensor Products – Schmidt Decomposition Theorem.	12
II	**Qubits & Quantum Model of Computation :** State of a quantum system – time evolution of a closed system – composite systems – measurement. Quantum model of computation: quantum circuit model – quantum gates – universal sets of quantum gates – unitary transformations.	12
III	**Quantum Algorithms :** Super dense Coding – Quantum Teleportation – Applications Of Teleportation – Probabilistic Versus Quantum Algorithms – Phase Kick-Back – The Deutsch Algorithm – The Deutsch- Jozsa Algorithm – Simon's Algorithm.	12
IV	**Quantum Algorithms** : Order - Finding Problem – Eigen value Estimation Approach to Order Finding – Shor's Algorithm for Order Finding – Finding Discrete Logarithms – Hidden Subgroups.	12
V	Quantum Computational Complexity and Error Correction :Computational Complexity – Black-Box Model – Lower Bounds for Searching – GeneralBlack-Box Lower Bounds – Polynomial Method – Block Sensitivity – Adversary Methods. Quantum Error Correction : Classical Error Correction – Classical Three-Bit Code – Fault Tolerance - Fault-Tolerant Quantum Computation.	12

Learning Resources	
Text books	P. Kaye, R. Laflamme, and M. Mosca, "An introduction to Quantum Computing", Oxford University Press, 1999.
Reference books	V. Sahni, "Quantum Computing", Tata McGraw-Hill Publishing Company, 2007.
Website/link	https://www.javatpoint.com/what-is-quantum-computing https://www.geeksforgeeks.org/introduction-quantum-computing/ https://www.javatpoint.com/how-does-a-quantum-computer-works

MAPPING WITH PROGRAM OUTCOMES

	PO01	PO02	PO03	PO04
CO1	S	S	S	M
CO2	S	M	S	S
CO3	S	S	S	S
CO4	S	S	M	S
	S	S	M	L

S-Strong , M- Medium , L – Low

Subject title	CYBER SECURITY	Semester	VI
Subject code	24U5ITDE09	Specialization	NA
Type	Elective : Theory	L:T:P:C	5:0:0:4

COURSE OBJECTIVE:

- Understanding Cyber Threat Landscape.
- Foundations of Information Security.
- Risk Assessment and Management:
- Students will learn how to identify and assess cyber security risks within an organization, and implement risk management strategies to mitigate these risks effectively.

CO NO.	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understanding of Cyber Threat Landscape	K1
CO2	Knowledge of Security Principles	K1,k2
CO3	Develop skills to assess and manage risks associated with cyber security	K2,k3
CO4	Develop the ability to communicate effectively about cyber security issues	K4
CO5	Embrace the ethical responsibilities inherent in cyber security practices	K4,k5

UNIT	CONTENTS	NO. OF HOURS
I	**Introduction to Information Systems**: Introduction to Information Systems - Types of Information Systems- Development of Information Systems- Changing the Nature of Information Systems- Introduction to Information Security- Need for Information Security- Threats to Information Systems Cyber security and Security Risk Analysis.	12
II	**Cyber security Application Security:** Application Security- Data Security Considerations: Backups- Archival- Security Technology- Intrusion Detection- Denial-of-Service (DOS) Attack- Security Threats- Security Threats to E-Commerce- Electronic Payment Systems	12
III	**Developing Secure Information Systems:** Secure Information System Development- Application Development Security- Information Security Governance and Risk Management –Security Issues in Hardware, Data Storage, and Downloadable Devices- Devices Physical Security of it Assets-Back-Up Security Measures	12
IV	Information Security Policies, Standards, and Cyber Law: Security Policies- Policy Review Process- Information Security Standards- Cyber Laws in India- Intellectual Property Law- Software Licenses	12
V	**Security of Emerging Technology:** Security of Big Data Analytics- Security of Cloud Computing- Security of Smart Grid- Security of Wireless Sensor Networks (WSNs).	12

LEARNING RESOURCES	
Text books	1. C.P. Gupta and K.K. Goyal. Cybersecurity: A Self-Teaching Introduction.ISBN: 978-1-68392-498-2 ,Copyright ©2019 by University Science Press (An imprint of Laxmi Publications Pvt. Ltd. All rightsreserved.)
Reference books	1. **"Research Methods in Cybersecurity" by Greg White, Alan Rea, Dwayne Williams**: This book provides an overview of various research methods specifically tailored to cybersecurity, covering both qualitative and quantitative approaches. **2."Cybersecurity Research Methods: Concepts and Practice" by Feng Liu, Geraldine Clarebout, WeizhiMeng**: This book offers a comprehensive guide to research methods in cybersecurity, discussing various methodologies, tools, and techniques. **3."Handbook of Research on Digital Crime, Cyberspace Security, and Information Assurance" edited by Joel Samick**: While not solely focused on research methods, this handbook provides valuable insights into conducting research in digital crime and cybersecurity, covering a wide range of topics. **4."Cybersecurity: A Practical Guide to the Law of Cyber Risk" by Sherri Davidoff, Jonathan L. Sander**:
Website/link	1. https://www.sciencedirect.com/book/9780128053492/research-methods-for-cyber-security 2. https://books.google.co.in/books/about/Research_Methods_for_Cyber_Security.html? 3. https://books.google.co.in/books?hl=en&lr=&id=aRl2DQAAQBAJ&oi=fnd&pg=PP1&dq=cyber+security+reference+books+pdf&ots=SmTP0zOBz0&sig=Tn8vaD9qV-O8oqE2a8G5KNVbzwk&redir_esc=y#v=onepage&q&f=false

MAPPING WITH PROGRAMME OUTCOMES

	PO01	PO02	PO03	PO04	PO05
CO1	M	M	S	S	M
CO2	L	L	S	S	M
CO3	S	S	S	S	L
CO4	S	S	S	M	L
CO5	L	L	S	M	L

S–Strong, M–Medium–Low

Subject title	WEB APPLICATION DEVELOPMENT	Semester	V
Subject code	24U5ITDE10	Specialization	CA
Type	Elective: Theory	L:T:P:C	5:0:0:4

COURSE OBJECTIVES :

1. To learn the basic web concepts and to create rich internet applications that use the most recent client-side Programming technologies.
2. To learn the basics of HTML, DHTML, XML, CSS, JavaScript AJAX.

CO NO.	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Develop and publish Web pages using Hypertext Markup Language(HTML).	K2
CO2	Optimize page styles and layout with Cascading Style Sheets(CSS).	K3
CO3	Analyze and apply the role of languages to create a capstone	K4
CO4	Develop websites using client-side web programmings languages like HTML, DHTML, CSS, XML, JavaScript, and AJAX.	K4
CO5	Create web applications using forms and validation of form fields	K6

UNIT	CONTENTS
I	**HTML**-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line breaks. Emphasizing test- heading and horizontal rules-list-font size, face and color-alignment- links-tables-frames
II	**Graphics:** Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with HTML forms textbox, password, list box, combo box, text area, tools for building web page front page.
III	Cascading style sheet (CSS)-what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language (XML). Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamic content styles & positioning-Event bubbling-data binding.
IV	Client-side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition, Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.
V	**Ajax:** Introduction, advantages &disadvantages, Purpose of it, ajax based web application, alternatives of ajax. Java Script & AJAX: Introduction to array operators, making statements-date & time-mathematics- strings-Event handling-form properties. AJAX. Introduction to jQuery and AngularJS.

TEXTBOOKS	
1	Pankaj Sharma, "Web Technology", Sk Kataria &SonsBangalore 2011.(UNIT I, II, III &IV).
2	Achyut S Godbole & Atul Kahate, "Web Technologies", 2002, 2nd Edition. (UNIT V:AJAX).
REFERENCE BOOKS	
1.	Laura Lemay, Rafe Colburn , Jennifer Kyrnin, "Mastering HTML, CSS & Javascript

	Web Publishing",2016.
2.	DT Editorial Services (Author), "HTML 5 Black Book (Covers CSS3, aScript,XML, XHTML, AJAX,PHP, jQuery)", Paperback 2016, 2ndEdition.
3.	Purewal, Semmy. Learning Web App Development: Build Quickly with Proven JavaScript Techniques. "O'Reilly Media, Inc.", 2014.
WEB RESOURCES	
1.	https://www.w3schools.com/whatis/default.asp
2.	https://www.edureka.co/blog/web-development-tutorial/
3.	https://www.tutorialspoint.com/website_development/index.htm

MAPPING WITH PROGRAMME OUTCOMES:

S-Strong M-Medium L-Low

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

Subject Title	Machine Learning	Semester	VI
Subject Code	24U5ITDE11	Specialization	NA
Type	Elective	L:T:P:C	5:0:0:4

Course objective:

- To understand the basic theory underlying machine learning.
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To apply the algorithms to a real-world problem, optimize the models learned and report onthe expected accuracy that can be achieved by applying the models.

CO No.	CO Statement	Knowledge Level
CO1	To introduce students to the basic concepts and techniques of Machine Learning.	K1
CO2	To learn Decision trees, KNN and Ensemble Techniques.	K2,K4
CO3	To implement and apply machine learning algorithms to real-world applications.	K3
CO4	To understand the problems using various machine learning Techniques.	K4
CO5	To study the recent machine learning software for solving practical problems.	K4

Unit	Contents	No. of Sessions
I	**THE FUNDAMENTALS OF MACHINE LEARNING:** What Is Machine Learning?-Why Use Machine Learning?-Examples of Applications- Supervised / Unsupervised Learning - Batch and Online Learning - Instance-Based Versus Model-Based Learning- Main Challenges of Machine Learning.	12
II	**UPERVISED LEARNING:** Classification and Regression - Generalization, Overfitting, and Underfitting - Supervised Machine Learning Algorithms : k-Nearest Neighbors - Linear Models - Naive Bayes Classifiers - Decision Trees - Ensembles of Decision Trees - Kernelized Support Vector Machines. Case study: Random Forest.	12
III	**UNSUPERVISED LEARNING:** Types of Unsupervised learning - Challenges in Unsupervised Learning- Preprocessing and Scaling - Different Kinds of Preprocessing - Clustering - k-Means Clustering - Agglomerative Clustering-DBSCAN - Comparing and Evaluating Clustering Algorithms.	12
IV	**IMPLEMENTING MACHINE LEARNING ALGORITHMS**: k –means Algorithm - steps to perform k-means Algorithm- How do k- mean algorithm work? – Pros & Cons – KNN versus k-means. Naïve Bayes Classification Algorithm: Understanding conditional probability – The Bayes Rule – types of events – Algorithm – Laplace correction – Pros & Cons - Applications.	12

V	**NEURAL NETWORKS:** Working of Neural Networks – Pros andCons - Applications – Support Vector Machine: How does SVM work?- Advantages and Disadvantages of SVM – **Working with Text Data:** Types of Data Represented as Strings - Representing Text Data as a Bag of Words- Stopwords - Advanced Tokenization, Stemming, and Lemmatization - Role of Machine Learning in Social media.	12

Learning Resources	
Text Books	1. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", Aurélien Géron, O'Reilly Media, 2019. 2. "Introduction to Machine Learning with Python ",Andreas C. Müller and Sarah Guido, O'Reilly Media,2017. 3. "Data Science and Machine Learning in R",Reema Thareja McGraw-Hill India, 2021.
Reference Books	1. Tom M. Mitchell- Machine Learning - McGraw Hill Education, International Edition. 2. Introduction to Machine Learning, Alex Smola and S.V.N. Vishwanathan, Cambridge University Press ,2008 3. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Mathematics for Machine Learning, Cambridge University Press (23 April 2020).
Website/Link	1. https://www.techtarget.com/searchenterpriseai/definition/supervised-learning 2. https://keremkargin.medium.com/nlp-tokenization-stemming-lemmatization-and-part-of-speech-tagging-9088ac068768 3. https://pianalytix.com/how-machine-learning-works-in-social-media-2/

Mapping with Programme Outcomes

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	S	S	S
CO4	S	S	M	S
CO5	S	S	S	S

S-Strong, M- Medium, L – Low

Subject title	COMPILER DESIGN	Semester	V
Subject code	24U5ITDE12	Specialization	CA
Type	Elective: Theory	L:T:P:C	5:0:0:4

COURSE OBJECTIVE:

- To introduce the concept of compiler with in detail coverage of basic tasks, metrics, issues, and implication.
- To introduce the concept of Syntactic specification of programming languages.

CO No.	CO Statement	Knowledge Level
CO1	To develop skills in compiler basics and applications	K1
CO2	To Understand about specifications of programming languages in detail.	K2,K4
CO3	Able to know how to apply syntax directed translation.	K3
CO4	Explores about run time storage and phase errors.	K4
CO5	To provide knowledge in code optimization and code generation.	K4

UNIT	CONTENTS	NO. OF SESSIONS
I	**Introduction to Compliers** : Compliers and Translator - Need of Translator - The structure of a Complier - Lexical analysis - Syntax analysis - Intermediate code generation -Optimization - Code generation - Complier writing tools. Finite automata and lexical Analysis: The role of the lexical analysis - A simple approach to the design of lexical analyzers- Regular expressions to finite automata - Minimizing the number of states of a DFA.	12
II	**The Syntactic specification of programming languages:** Context free grammars -Derivations and parse trees - Capabilities of context free grammars. Basic parsing techniques: Parsers - Shift reduce parsing - Operator precedence parsing - Top down parsing - Predictiveparsers.	12
III	**Syntax directed translation:** Intermediate code - Postfix notation - Parse trees and syntax trees - 3 address code - Quadruples and triples-Boolean expressions - Statements that alter the flow of control. Symbol tables: The contents of a symbol table - Data structures for symbol table - Representing scope	12
IV	**Run time storage administration:** Implementation of a simple stack allocation scheme -Implementation of block-structured languages. Error deduction and recovery: Errors - Lexical phase errors - Syntactic phase errors - Semantic errors.	12
V	**Introduction of code optimization:** The principle sources of optimization - Loop optimization - The DAG representation of basic blocks-Global data flow analysis. Code generation: Object programs - Problems in code generation-A simple code generator - Register allocation and assignment - Code generation from DAGâ€˜s-Peepholes optimization	12

LEARNING RESOURCES	
TEXT BOOKS	nciples of Complier Design by Alfred V.Aho, Jeffrey D.Ullman , Narosa Publications House.

REFERENCE BOOKS	odern Compiler Design by David Galles, Fifth Edition 2012.
WEBSITE/LINK	http://www.w3schools.com/php/php_mysql_intro.asp. http://www.tutorialspoint.com/mysql/mysql-php-syntax.htm http://downloads.mysql.com/docs/apis-php-en.pdf

MAPPING WITH PROGRAMME OUTCOMES

	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong, M- Medium, L – Low

Subject Title	Computer Vision & Virtual Reality	Semester	I
Subject Code	24U5ITDE13	Specialization	NA
Type	Electice: Theory	L:T:P:C	5:0:0:4

Course objective:

- To Implement fundamental image processing techniques required for computer vision
- To Understand Image formation process
- To Develop computer vision applications

CO No.	CO Statement	Knowledge Level
CO1	To study about imaging and image representation	K1
CO2	To learn about the techniques of Binary Image Analysis and Morphology	K2
CO3	To gain the knowledge about the Pattern Recognition and classifier of the image.	K2, K3
CO4	To implement the Image Filtering and Enhancing Techniques	K4
CO5	To gain the knowledge about the image Color and Shading of an image.	K2, K3

Unit	Contents	No. of Sessions
I	**Introduction:** Machines that see?- Application Problems-Operations on Images- The Good, the Bad, and the Ugly- Use of Computers and Software. Imaging and Image Representation: Sensing Light – Imaging Devices- Problems in Digital Images- Picture Functions and Digital Images- Digital Image Formats- Richness and Problems of Real Imagery- 3D Structure from 2D Images.	12
II	**Binary Image Analysis:** Pixel and Neighborhoods- Applying Masks to Images- Counting the Objects in an Image – Connected Components Labeling- Binary Image Morphology: Structuring Elements, Basic Operations, Some Applications of Binary Morphology, Conditional Dilation- Region Properties- Region Adjacency Graphs- Thresholding Grayscale Images- The Use of Histograms for Threshold selection- Automatic Thresholding.	12
III	**Pattern Recognition:** Pattern Recognition Problems- Common model for classification- Precision versus recall- Features used for representation- Feature Vector Representation- Implementing the Classifier- Structural Techniques- The Confusion Matrix- Decision Trees- Bayesian decision Making- Decisions using Multidimensional Data- Machines the Learn- Artificial Neural Nets.	12
IV	**Filtering and Enhancing Images:** What needs fixing- Grey level mapping- Histogram equalization- Removal of Small Image Regions- Removal of Salt and Pepper Noise- Removal of Small Components - Image smoothing- Detecting Edges using Differencing Masks. **Texure:** Texture, Texels, and Statistics- Texel Based Texture Descriptions- Quantitative Texture Measures: Edge Density and Direction- Texture Segmentation.	12
V	**Color and Shading:** Some Physics of Color- Sensing Illuminated Objects – Additional Factors – Sensitivity of Receptors- The RGB Basis for Color- Other Color Bases- CMY Subtractive Color System- HSI- YIQ, YUV for TV Signals- Color Histograms- Color Segmentation. **Virtual Reality:** Features of Virtual Reality Systems- Applications of VR- Augmented Reality- Teleoperation- Virtual Reality Devices.	12

Learning Resources	
Text Books	1. Linda Shapiro, George Stockman, “Computer Vision”, 2000.
Reference Books	1. Mubarak Shah, “Fundamentals of Computer Vision” –, 1992. 2. Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer, 2010.
Website/Link	http://szeliski.org/Book/.

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject title	Computational Thinking	Semester	VI
Subject code	24U5ITDE14	Specialization	CA
Type	Elective: Theory	L:T:P:C	5:0:0:4

COURSE OBJECTIVE:

1. Convert real world situations to appropriate problem statements and identify the input, algorithmic approach involved and expected output.
2. Design solutions to mathematical problems following a top-down approach.
3. Argue on the appropriateness of solution developed with respect to complexity by eliminating redundant comparisons and swaps.
4. Apply suitable strategies on loop initials, iterations and terminations while implementing Algorithms.

CO NO.	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To explain importance of problem solving aspect.	K1
CO2	To develop understanding of computation for various applications	K2,K4
CO3	To design effective algorithm for various applications	K3
CO4	To explain array concepts	K4
CO5	To apply algorithms for stack, queue and Linked List	K4

UNIT	CONTENTS	NO. OF SESSIONS
I	**Introduction:** The problem solving aspect, Top down design, Implementation of algorithms, Program Specification, The Efficiency of Algorithms	12
II	Exchange the values of two variables - Counting - Summation of a set of number - factorial computation - Sine Function computation - Generation of the Fibonacci sequence - Reversing the digits of an integer - Base conversion - Character to number conversion.	12
III	Finding the square root of a number - The smallest divisor of an integer - The 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 n-th Fibonacci number.	12
IV	Array Order Reversal-Finding the maximum number in a set- Removal of Duplicates from an ordered Array- Finding the k^{th} smallest element –Binary Search	12
V	Stack operations-Queue Addition and Deletion- Linked List search-Linked List insertion and Deletion- Binary Tree search	12

Learning Resources	
TEXT BOOKS	1. R.G.Dromey, How to solve it by computer - Pearson, 2011.
REFERENCE BOOKS	1. Kunth -Fundamental Algorithm ,Narosa Publishing House, 2003.

WEBSITE/LINK	1. https://en.wikipedia.org/wiki/Computational_thinking 2. https://www.coursera.org/learn/computational-thinking-problem-solving 3. https://www.bbc.co.uk/bitesize/guides/zp92mp3/revision/1

MAPPING WITH PROGRAMME OUTCOMES

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject title	Nural Networks and Fuzzy LogicC	Semester	VI
Subject code	24U5ITDE15	Specialization	CA
Type	Elective: Theory	L:T:P:C	5:0:0:4

COURSE OBJECTIVE:

1. The main objective of this course is to provide the student with the basic understanding of neural networks and fuzzy logic fundamentals,
2. Program the related algorithms and Design the required and related systems.
3. Biological motivation to design intelligent systems and control
4. Study the learning strategies of Artificial Neural networks and theirϖ training algorithms

CO NO.	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Comprehend the concepts of feed forward neural networks	K1
CO2	Analyze the various feedback networks.	K2,K4
CO3	Understand the concept of fuzziness involved in various systems and fuzzy set theory.	K3
CO4	Comprehend the fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm	K4
CO5	Analyze the application of fuzzy logic control to real time systems.	K4

UNIT	CONTENTS	NO. OF SESSIONS
I	**Introduction:** What is Neural Network-Human Brian-Models of a Neuron-Network Architecture-Knowledge Representation- AI& Neural Networks	12
II	**Learning Processes:** Introduction-Error-Correction Learning-Memory-Based Learning- Hebbian Learning-Competitive learning-Boltzmann Learning- learning with a Teacher - learning without a Teacher- learning Tasks	12
III	**Single Layer Perceptions:** Introduction –Adaptive Filtering Problem-Unconstrained Optimization Techniques-Linear Least Square Filters. Multilayer Perceptions: Introduction- Back propagation Algorithm - Back propagation and Differentiation.	12
IV	**Introduction:** What is Fuzzy Logic- History-Motivation-Why Using Fuzzy Logic for control. Basic Concept of Fuzzy Logic: Two Exemplary Problems-Fuzzy sets-Linguistic Variables-Fuzzy Rules	12
V	**Fuzzy Sets:** Classical sets-Fuzzy sets-Operation of fuzzy sets-Properties of Fuzzy Sets-Geometric Interpretation of fuzzy sets.	12

LEARNING RESOURCES	
TEXT BOOKS	1. Neural Network A Comprehensive Foundation- , Simon Haykin Mc Master University,Hamilyon, Ontario,Canada. [UNIT – I, II & III] 2. Fuzzy Logic intelligence , Control and information- John Yen Reza Langari , Center for fuzzy Logic,Robotics, and Intelligent Systems Texas A&M University. [UNIT – IV & V]

REFERENCE BOOKS	4. Neural Networks and Fuzzy System-dynamical System approach to machine intelligent, Bart Kosko University of Southern California 5. LauranceFausett, Englewood cliffs, N.J., "Fundamentals of Neural Networks", PearsonEducation, New Delhi, 2008
WEBSITE/LINK	1. ieeexplore.ieee.org 2. www.sciencedirect.com/

MAPPING WITH PROGRAMME OUTCOMES

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	BLOCK CHAIN TECHNOLOGIES	Semester	III
Subject Code	24U5ITDE16	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course objective:

- Impart strong technical understanding of Block chain technologies
- Develop familiarity of current technologies, tools, and implementation strategies
- Introduce application areas, current practices, and research activity.

CO No.	CO Statement	Knowledge Level
CO1	Understand the types, benefits and limitation of block chain.	K1
CO2	Explore the block chain decentralization and cryptography concepts.	K2,K4
CO3	Enumerate the Bitcoin features and its alternative options.	K3
CO4	Describe and deploy the smart contracts.	K4
CO5	Summarize the block chain features outside of currencies.	K4

Unit	Contents	No. of Sessions
I	**Introduction to Blockchain&Crypto currencies:** Blockchain-Public Ledgers, Blockchainas Public Ledgers- Bitcoin, Blockchain2.0, Smart Contracts, Blockin a Blockchain, Transactions-Distributed Consensus, The Chain and the Longest Chain-Cryptographic Hash Functions–Hash Pointers and Data Structures – Digital Signatures – Public Keys as Identities – A Simple Cryptocurrency.	**12**
II	**How Bitcoin Achieves Decentralization:** Centralization vs. Decentralization-Distributed consensus–Consensus without identity using a blockchain-Incentives and proof of work.	**12**
III	**Mechanics of Bitcoin:** Bit coin transactions – Bit coin Scripts – Applications ofBitcoinscripts–Bitcoinblocks–TheBitcoinnetwork-Limitationsandimprovements.	**12**
IV	**How to Store and Use Bitcoins:** Simple Local Storage – Hot and Cold Storage –Splitting and Sharing Keys–Online Wallets and Exchanges–Payment Services–Transaction Fees– Currency Exchange Markets.	**12**
V	**Community, Politics, and Regulation:** Consensus in Bit coin – Bitcoin Core Software – Stakeholders: Who's in Charge? – Roots of Bitcoin – Governments Notice Bitcoin – Anti Money-Laundering – Regulation – New York's Bit License Proposal**.**	
Learning Resources		

Text Books	1.ArvindNarayanan, JosephBonneau, EdwardFelten, Andrew Miller, and Steven Goldfeder."Bitcoinand cryptocurrency technologies: a comprehensive introduction". Princeton University Press, 2016.
Reference Books	1.Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "Big Data for Dummies", John Wiley & Sons, Inc., 2013. 2. Tom White, "Hadoop: The Definitive Guide", Reilly Publications, 2011. 3. Kyle Banker, "Mongo DB in Action", Manning Publications Company, 2012. 4. Russell Bradberry, Eric Blow, "Practical Cassandra A developers Approach", Pearson Education, 2014.
Website/Link	1. https://www.webopedia.com/TERM/B/Big_data_analytics.html 2. https://www.simplilearn.com/data-science-vs-big-data-vs-data-analytics-article

Mapping with programme Outcomes

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject title	ETHICAL HACKING	Semester	VI
Subject code	24U5ITDE17	Specialization	CA
Type	Elective: Theory	L:T:P:C	4:0:0:4

COURSE OBJECTIVE:

1. To understand the fundamental concepts of computer system, including hardware and software.
2. To Design, and analyze precise specifications of algorithms, procedures, and interaction behavior.
3. To apply the appropriate technologies, skills and tools in various fields of Computer Science.
4. To analyze impacts of computing on individuals, organization and society.

CO NO.	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Plan a vulnerability assessment and penetration test for a network.	K1
CO2	Execute a penetration test using standard hacking tools in an ethical manner.	K2,K4
CO3	Report on the strengths and vulnerabilities of the tested network.	K3
CO4	Identify legal and ethical issues related to vulnerability and penetration testing.	K4
CO5	Be able to evaluate the security status of systems and suggest solutions for removing security vulnerabilities	K4

UNIT	CONTENTS	NO. OF SESSIONS
I	**Introduction to hacking, ports and protocols:** Hacking-Introduction to hacking-Types of hacking-Phases of hacking-protocols in hacking-Virtualization. Deep web-Introduction to Deep web-Dark Net-TOR (The Online Router).	12
II	**Scanning, Hacking and Foot Printing:** Scanning-What is scanning? Basics of scanning-Techniques of Scanning. System Hacking-Process of system Hacking-Password Cracking. Foot printing-Foot Printing types.	12
III	**Malwares, Viruses and Worms:** Malwares-Trojans-Working of Trojans. Virus-Introduction to virus - Working of Virus-Characteristics of Virus. Worms.	12
IV	**Social Engineering:** Social Engineering-Introduction to Social Engineering-Process of social engineering-Identity theft. Phishing. What are Phishing-phishing process-types of phishing Attacks.	12
V	**Cryptography and Stenography:** Cryptography: Cryptography-Digital Signature-Hash functions. Stenography-what is stenography-stenography process-Terms associated with stenography-Methods-Stenography tools	12

Learning Resources	
Text books	1. Harsh Bothra, 2017,"Hacking:Be a Hacker with Ethics", Kindle edition, Kanna Publishing.

Reference books	1. Roger A Grimes, 2017,"Hacking the Hacker", John Wiley & Sons. 2. Michael Gregg, 2017, Certified Ethical Hacker (CEH), Second Edition, Pearson IT Certification version 9.
Website/link	3. ieeexplore.ieee.org 4. www.sciencedirect.com/

MAPPING WITH PROGRAMME OUTCOMES

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

SUBJECT TITLE	DATA MINING AND WAREHOUSING	SEMESTER	VI
SUBJECT CODE	24U6ITDE18	SPECIALIZATION	NA
TYPE	ELECTIVE : THEORY	L:T:P:C	4:0:0:4

Course objective:

- To provide the knowledge on Data Mining and Warehousing concepts and techniques.
- To study the basic concepts of cluster analysis.
- To study a set of typical clustering methodologies, algorithms, andapplications.

CO NO.	CO STATEMENT	KNOWLEDGE LEVEL
CO1	To understand the basic concepts and the functionality of the various data mining and data warehousing component	K1
CO2	To know the concepts of Data mining system architectures	K1,k2
CO3	To analyze the principles of association rules	K2,k3
CO4	To get analytical idea on Classification and prediction methods.	K4
CO5	To Gain knowledge on Cluster analysis and its methods.	K4,k5

UNIT	CONTENTS	NO. OF HOURS
I	Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction.	12
II	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures	12
III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data Warehouses	12
IV	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on Concepts from Association Rule Mining – Other Methods. Prediction – Introduction – Classifier Accuracy.	12
V	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Petitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method.	12

LEARNING RESOURCES	
TEXT BOOKS	Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, HarcourtIndia Pvt. Ltd, New Delhi.
REFERENCE BOOKS	K.P. Soman, Shyam Diwakar, V. Ajay "Insight into Data Mining Theory and Practice ", Prentice Hall of India Pvt. Ltd, New Delhi.
WEBSITE/ LINK	Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques', Cambridge University Press, 2019.

MAPPING WITH PROGRAMME OUTCOMES

	PO01	PO02	PO03	PO04	PO05
CO1	**L**	**S**	**M**	**S**	**M**
CO2	**S**	**L**	**S**	**L**	**S**
CO3	**M**	**S**	**L**	**M**	**S**
CO4	**L**	**S**	**S**	**L**	**S**
CO5	**S**	**M**	**M**	**S**	**L**

S–Strong, M–Medium, L–Low

Skill Based Elective Course

Subject Title	HUMAN COMPUTER INTERACTION	Semester	II
Subject Code	24U2ITS01	Specialization	NA
Type	CORE: THEORY	L:T:P:C	2:0:0:2

COURSE OBJECTIVE:

1. Understand Fundamental HCI Concepts
2. Develop Skills in Designing User Interfaces
3. Apply User-Centered Design (UCD) Methodology

CO No.	CO Statement	Knowledge Level
CO1	Students will understand human cognitive processes, memory, emotions, and individual differences to enhance interaction design and usability.	K1
CO2	Students will understand computer hardware, including input devices, displays, memory, and paper, to improve system design and user interfaces.	K2, K4
CO3	Students will learn interaction models, ergonomic design, and interface styles to create effective user interfaces, including 2D/3D navigation and WIMP elements.	K3
CO4	Students will apply design principles, user focus, and iterative prototyping to create effective screen layouts and incorporate HCI in the software life cycle to improve usability and design rationale.	K1, K2
CO5	Students will analyze and apply design rules, principles, standards, and heuristics to enhance usability and interface effectiveness	K4

Unit	Contents	No. of Hrs
I	**The human:** Introduction - Input–Output channels - Human memory - Thinking: Reasoning and Problem Solving - Emotion - Individual differences. (1.1 to 1.5)	6
II	**The Computer:** Introduction - Text entry devices - Positioning, pointing and drawing - Display devices - Paper: printing and scanning – Memory. (2.1 to 2.8)	6
III	**The interaction:** Introduction - Models of interaction - Frameworks and HCI – Ergonomics: Design Focus: Industrial interfaces - Interaction styles: Design Focus: Navigation in 3D and 2D - Elements of the WIMP interface - Design Focus: Learning toolbars - Interactivity (3.1 to 3.7)	6
IV	**Interaction design basics:** What is design - The process of design - User focus – Screen design and layout - Iteration and prototyping. **HCI in the software process:** The software life cycle - Usability engineering - Iterative design and prototyping - Design rationale. (5.2 to 5.4, 5.7 to 5.8, 6.2 to 6.5)	6
V	**Design rules:** Introduction - Principles to support usability – Standards – Guidelines - Golden rules and heuristics - HCI patterns. (7.1 to 7.7)	6

Learning Resources	
Text book	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human -Computer Interaction", 3rd Edition, Pearson Education, 2004.
Reference book	Serengul Smith-Atakan, "Human-Computer Interaction: Basics and Practice", Bentham books.
Website / Link	https://www.tutorialspoint.com/human_computer_interface/index.htm

Subject title	Advanced Excel	Semester	V
Subject code	24U5ITS03	Specialization	CA
Type	SBEC : Theory	L:T:P:C	2:0:0:2

COURSE OBJECTIVE:

- The objective of this course is to help the students learn the advanced features of Excel.
- To summarise, analyse, explore, and present visualisations of data in the form of charts, graphs.

CO No.	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Handle large amounts of data	K1
CO2	Aggregate numeric data and summarise into categories and subcategories	K2
CO3	Filtering, sorting, and grouping data or subsets of data	K3
CO4	Create pivot tables to consolidate data from multiple files	K4
CO5	Presenting data in the form of charts and graphs	K4

UNIT	CONTENTS	NO. OF SESSIONS
I	Basics of Excel – Customizing common options – Absolute and relative cells – Protecting and un-protecting worksheets and cells – Working with Functions – Writing conditional expressions – logical functions – lookup and reference functions: VlookUP with Exact Match, Approximate Match, – Using VLookUP to consolidate Data from Multiple Sheets.	6
II	Data Validations - Specifying a valid range of values - Specifying a list of valid values – Specifying custom validations based on formula – Working with Templates – Designing the structure of a template - Sorting and Filtering Data - Sorting tables – multiple-level sorting - custom sorting - Filtering data for selected view - advanced filter options.	6
III	Creating Pivot tables Formatting and customizing Pivot tables – advanced options of Pivot tables – Pivot charts – External data sources – data consolidation feature to consolidate data – Show Value As % of Row, % of Column, Running Total, Compare with Specific Field – Viewing Subtotal under Pivot.	8
IV	More Functions: Date and time functions – Text functions – Database functions – Power Functions – Formatting Using auto formatting option for worksheets – Using conditional formatting option for rows, columns and cells – WhatIf Analysis – Data Tables.	4
V	Charts: Formatting Charts – 3D Graphs – Bar and Line Chart together – Secondary Axis in Graphs – Sharing Charts with PowerPoint / MS Word, Dynamically – Inline Charts, data Charts – Overview of all the new features.	6

LEARNING RESOURCES	
Text books	1. Excel 2019 All-in-One For Dummies – 2018- Greg Harvey
Reference books	1.Microsoft Excel 2019 Pivot Table Data Crunching-2019,Bill Jelen and Michael Alexander 2. **"Excel 2019 Bible"Author**: Michael Alexander, Richard Kusleika, and John Walkenbach,**Publisher**: Wiley,**Publication Year**: 2018 **3."Excel Power Pivot & Power Query For Dummies" Author**: Michael Alexander

	Publisher: WileyN **Publication Year**: 2016
Website/link	1) https://www.tutorialspoint.com/advanced_excel/advanced_excel_tutorial.pdf 2) https://www.coursera.org/learn/excel-advanced 3) https://www.upgrad.com/blog/advanced-excel-formulas-a-must-know-for-all-professionals/

MAPPING WITH PROGRAMME OUTCOMES

	PO01	**PO02**	**PO03**	**PO04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	Sentiment Analysis	Semester	VI
Subject Code	24U6ITS06	Specialization	CA
Type	SBEC : Theory	L:T:P:C	2:0:0:2

Course objective:

To introduce to computational study of people's opinions, sentiments, emotions, moods, and attitudes

CO No.	CO Statement	Knowledge Level
CO1	To understand the underlying structure of the problem commonly used to express opinions, sentiments, and emotions	K1
CO2	To understand the underlying structure of the language constructscommonly used to express opinions, sentiments, and emotions	K2,K4
CO3	To understand core areas of sentiment analysis	K3
CO4	To understand rules and extraction of entity in sentiment analysis	K4
CO5	To understand sentiment lexicon generation	K4

Unit	Contents	No. of Sessions
I	Introduction, Sentiment analysis applications, Sentiment analysis research, Sentiment analysisas mini-NLP,The Problem of Sentiment Analysis, Definition of opinion, Definition of opinionsummary.	12
II	Different types of opinions, Document Sentiment Classification, Supervised sentiment classification, Unsupervised sentiment classification, Sentiment rating prediction, Cross-Domain Sentiment Classification, Cross-Language Sentiment Classification.	12
III	Sentence Subjectivity and Sentiment Classification, Subjectivity, Sentence SubjectivityClassification, Sentence Sentiment Classification, Aspect Sentiment Classification	12
IV	Rules ofSentiment composition, Negation and Sentiment, Aspect and Entity Extraction, Frequencybased aspect extraction, Exploring syntactic relations, Using supervised learning	12
V	Sentiment Lexicon Generation, Dictionary based approach, Corpus based approach, Sentimentword embedding, Analysis of Comparative Opinions, Problem definition, Identifyingcomparative sentences, Identifying the preferred entity set, Special types of comparison	12

Learning Resources	
Text Books	Sentiment Analysis: Mining Opinions, Sentiments, and Emotions, by Bing Liu

Reference Books	1. Sentiment Analysis in Social Networks By Federico Pozzi, Elisabetta Fersini, EnzaMessina, Bing Liu · 2016 2. Sentiment Analysis for Social Media, Antonio Moreno, Carlos A. Iglesias, MDPI 2020 3. New Opportunities for Sentiment Analysis and Information Processing, AakanshaSharaff, G. R. Sinha, Surbhi Bhatia, IGI Global, 2021 4. Sentiment Analysis and Knowledge Discovery in Contemporary Business, Dharmendra Singh Rajput, Ramjeevan Singh Thakur, S. Muzamil Basha, IGI Global, 2018
Website/Link	https://www.analyticsvidhya.com/blog/2021/06/nlp-sentiment-analysis/ https://www.geeksforgeeks.org/what-is-sentiment-analysis/

Mapping with Programme Outcomes

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject title	ANALYTICAL SKILLS	Semester	VI
Subject code	24U6ITS07	Specialization	CA
Type	SBEC : Theory	L:T:P:C	2:0:0:2

COURSE OBJECTIVE:

Intended to inculcate quantitative analytical skills and reasoning as an inherent ability in students.

CO NO.	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the basic concepts of arithmetic ability, quantitative ability, logical reasoning, business computations and data interpretation and obtain the associated skills.	K1
CO2	Apply the skills and competencies acquired in the related areas	K2
CO3	Analyze the problem and use logic to interpret and handle different situations	K3
CO4	Solve problems pertaining to quantitative ability, logical reasoning and verbal ability inside and outsidethe campus.	K4
CO5	Acquire competency in the use of verbal reasoning	K4

UNIT	CONTENTS	NO. OF SESSIONS
I	Number system: Types of numbers, rules of divisibility, multiplicity and squaring of numbers, HCF and LCM of numbers. Average: Average of numbers, Arithmetic Mean, Real-life examples of average, Application based questions	6
II	Number series: Series Completion, Analogy, Classification. Coding-Decoding: Letter Coding, Direct Letter Coding, Number / Symbol Coding, deciphering message word codes, number and symbol codes for messages	6
III	Percentage: Concept of Percentage, Comparison based questions, Application-based questions. Profit and Loss: Profit or Loss, Cost price, Selling price, Calculation of profit and loss percent, Application-based questions, conceptual formulae.	6
IV	Simple interest: the concept of simple interest, general formulas, application-based questions. Compound interest: basic concepts and formula-based questions, the difference between simple interest and compound interest	6
V	Alphabet Test: Alphabetical order of words, Letter-word problems, Word formation by unscrambling letters. Number Test: Number Test, Position switching of numbers. Blood Relation: Coded Relations, relation-based puzzle.	6

LEARNING RESOURCES	
Text books	1. A MODERN APPROACH TO NON-VERBAL REASONING by R S AGGARWAL, S Chand Publishing 2. QUANTITATIVE APTITUDE FOR COMPETITIVE EXAMINATIONS by R S AGGARWAL, S Chand Publishing 3. QUANTITATIVE APTITUDE by ABHIJIT GUHA, Tata McGraw Hill, India

Reference books	1. Analytical skills by Showick Thorpe, published by S Chand And Company Limited, Ramnagar,New Delhi-110055 2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers. 3. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw HillPublications
Website/link	1) What Are Analytical Skills? Definition and Examples - Forage (theforage.com) 2) What Are Analytical Skills? 9 Examples & Tips to Improve (betterup.com) 3) 7 Steps To Improve Your Analytical Thinking Skills (talentbridge.com)

MAPPING WITH PROGRAMME OUTCOMES

	PO01	PO02	PO03	PO04
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low