DEPARTMENT OF COMPUTER SCIENCE

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Rathinam Techzone, Pollachi Road, Eachanari,Coimbatore – 641021

Syllabus for

B.Sc AI&ML Curriculum Structure - Regulation - 2024

(I - VI Semester)

2024 – 2025 Batch onwards

Vision and Mission of the Institution

Vision

To emerge as a world-renowned Institution that is integrated with industry to impart Knowledge, Skills, Research Culture and Values in youngsters who can accelerate the overall development of India

Mission

To provide quality education at affordable cost, build academic and research excellence, maintain eco-friendly and robust infrastructure, and to create a team of well qualified faculty who can build global competency and employability among the youth of India

Motto

Transform the youth into National Asset

Vision and Mission of the Department

Vision

To become a globally recognized and deeply connected with the tech industry, fostering a culture of knowledge, skills, research, and values in aspiring computer scientists, empowering them to drive India's holistic technological advancement.

To establish a department with global recognition deeply intertwined with the technology sector, facilitating the exchange of knowledge and skills, cultivating a culture of research, and imbuing aspiring computer scientists with values, thereby empowering them to spearhead India's comprehensive technological progress

Mission

To empower students and cultivate academic and research brilliance and provide them to leverage Technology as a tool for innovation and fostering global competitiveness and employability in diverse field.

To empower students, nurturing academic and research excellence, while equipping them to utilize technology as a catalyst for innovation, enhancing global competitiveness and employability across diverse fields.

Motto

Industry – Ready Education

Program Educational Objectives (PEO)

Within a few years of graduation, our alumni will:

PEO1	:	Be successful in top graduate schools and in professional positions within academic & research institutions and industries, and in entrepreneurial and consultancy ventures.
PEO2	:	Contribute their Artificial intelligence and machine learning expertise effectively as members of technological Teams.
PEO3	:	Demonstrate lifelong learning and engagement through continued professional development, and participation and leadership in professional societies and organizations.
PEO4	:	Conduct themselves in a responsible, professional, and ethical manner.
PEO5	:	Emerge as a globally competent and universally employable professional who accelerates the overall development of India.

Mapping of Institute Mission to PEO

Institute Mission	**PEO's**
To provide quality education at affordable cost, build academic and research excellence maintain eco-friendly and robust infrastructure, and	PEO1, PEO2
To create a team of well qualified faculty who can build global competency and employability among the youth of India.	PEO2, PEO5

Mapping of Department Mission to PEO

Department Mission	**PEO's**
To empower students and cultivate academic and research brilliance	PE01, PE02
Provide them to leverage Technology as a tool for innovation	PEO3
Fostering global competitiveness and employability in diverse field	PE04,PE05

Program Outcomes (PO):

During the completion of the program, the graduate will be able to:

PO1 (Disciplinary Knowledge)	:	Demonstrate knowledge competency in required disciplines in University level courses appropriate to the study program.
PO2 (Problem Analysis)	:	Apply appropriate knowledge and adopt suitable skills to identify, formulate, analyze and solve complex problems in real life situations and reach substantiated conclusions.
PO3 (Investigation)	:	Conduct investigation of complex problems by following scientific approach to knowledge development that include appropriate experiments, analysis, evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; interpretation of data, formulation of coherent arguments and synthesis of information (assumptions, hypothesis or implications) in order to reach valid conclusions.
PO4 (Design of Solutions)	:	Design solutions for complex, open-ended real-life problems and to design systems, components or processes that meet specific needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
PO5 (Modern Tool Usage)	:	Create, select, apply, adapt, and extend appropriate techniques, resources, and modern tools to a range of activities, from simple to complex, with an understanding of the associated limitations.
PO6 (Individual and Team Work)	:	Work effectively and respectfully as a member and leader in teams, facilitate cooperative or coordinated effort, act together as a group or a team in the interests of a common cause and work efficiently, preferably in a multi-disciplinary setting. Possess knowledge of the values and beliefs of multiple cultures and a global perspective. Task mapping, setting direction, building a team, formulating an inspiring vision, motivating and inspiring team members who can help achieve the vision, and guide people to the right destination.
PO7 (Communication)	:	Express complex concepts within the profession and with society at large. Such ability includes listening, speaking, reading and writing, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
PO8 (Professionalism)	:	Understand the professional roles and responsibilities in society, especially the primary role of protection of the public and the public interest.
PO9 (Environment and Sustainability)	:	Analyze social and environmental aspects of-------activities. Such ability includes an understanding of the interactions that ----- has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.

PO10 (Moral and Ethical Awareness)	:	Embrace moral/ ethical values; formulate a position/ argument about an ethical issue from multiple perspectives and apply professional ethics, accountability and equity.
PO11 (Economics and Project Management)	:	Appropriately incorporate economics and business practices including project, risk, and change management into the practice of ----- and to understand their limitations.
PO12 (Life-long Learning)	:	Identify and address their own educational needs in a changing World in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

Program Specific Outcomes (PSO):

PSO1	:	The course ensures that all theoretical concepts are practically applied, preparing students effectively for the industry.
PSO2	:	The course content equips students with the skills necessary for self-entrepreneurship in the field of artificial intelligence and machine learning
PSO3	:	The course syllabus serves as a solid foundation for advanced studies in computer science within the realm of artificial intelligence and machine learning

Correlation between the PO/PSO and the PEOs

Program Outcomes		PEO1	PEO2	PEO3	PEO4	PEO5
PO1	:	L	M	M	M	L
PO2	:	M	S	L	S	S
PO3	:	L	S	S	M	M
PO4	:	S	S	L	S	S
PO5	:	M	L	S	S	S
PO6	:	S	S	M	M	S
PO7	:	S	L	S	S	M
PO8	:	M	M	L	M	S
PO9	:	S	S	S	L	M
PSO1	:	L	L	S	M	S
PSO2	:	M	S	M	L	M
PSO3	:	S	M	L	S	M

Components considered for Course Delivery is listed below:

1. Class room Lecture
2. Laboratory class and demo
3. Assignments
4. Mini Project
5. Project
6. Online Course
7. External Participation
8. Seminar
9. Internship

Mapping of POs with Course Delivery:

Program Outcomes	Course Delivery								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
PO1	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**
PO2	2	3	1	1	2	1	3	3	1
PO3	3	2	2	3	3	3	1	2	3
PO4	3	3	1	3	1	1	1	2	2
PO5	2	3	2	3	3	1	1	3	1
PO6	3	2	1	2	1	3	3	3	3
PO7	2	3	3	2	3	1	2	3	3
PO8	2	3	1	3	1	1	2	3	2
PO9	2	2	1	2	3	3	2	3	2
PSO1	1	1	2	3	3	3	2	3	3
PSO2	2	3	2	3	2	2	2	2	2
PSO3	1	1	2	2	2	3	3	2	3

3 – Strong correlation; 2-moderate correlation; 1-Less correlation; Blank-no correlation

S.No.	Sem	Part	Sub Type	Course Code	Course Name	Credit	Hours	INT	EXT	Total
1	1	1	L1		Language - I	3	5	50	50	100
2	1	2	L2		English - I	3	5	50	50	100
3	1	3	Core		Core Course – I Theory Problem Solving Techniques Using C	4	5	50	50	100
4	1	3	Core		Core Course – II Theory / Practical Problem Solving Techniques Using C	4	4	50	50	100
5	1	3	Allied		Allied-I Mathematics for Computer Science	4	5	50	50	100
6	1	4	SEC		Skill Enhancement Courses – I Database Management System / Practical – Database Management system Lab	4	4	50	50	100
7	1	4	AEC		Ability Enhancement Course I Environmental Studies or Universal Human Values & Professional Ethics	2	2	50	0	50
						24	**30**	**350**	**300**	**650**
1	2	1	L1		Language - II	3	5	50	50	100
2	2	2	L2		English - II	3	5	50	50	100
3	2	3	Core		Core Course – V **Theory** Python Programming	4	5	50	50	100
4	2	3	Core		Core Course – VI **Theory** / Practical Python Programming	4	4	50	50	100

					Lab					
5	2	3	Elective		Elective - I Entrepreneurship Development	4	4	50	50	100
6	2	3	Allied		Allied-II Numerical Methods	4	5	50	50	100
7	2	4	AEC		Ability Enhancement Course II Design Thinking	2	2	50	0	50
8	2	5	Ext		Extension Activity - I (NASA)	1	0	25	0	25
						25	**30**	**375**	**300**	**675**
1	3	1	L1		Language - III	3	4	50	50	100
2	3	2	L2		English - III	3	4	50	50	100
3	3	3	Core		Core Course – V Theory Artificial Intelligence	4	6	50	50	100
4	3	3	Core		Core Course – VI Theory / Practical Artificial Intelligence Lab	4	4	50	50	100
5	3	3	Allied		Allied-III Statistics for Machine Learning	4	5	50	50	100
6	3	4	SEC		Skill Enhancement Courses – II Practical / Training Mobile Application Development	4	5	50	50	100
7	3	4	AEC		Ability Enhancement Course III Soft Skill-1	2	2	50	0	50
8	3	3	ITR		Internship / Industrial Training (Summer vacation at the end of II semester activity)	2	0	50	0	50
9	3	5	Ext		Extension Activity - II	1	0	25	0	25

					(NASA)					
						27	**30**	**425**	**300**	**725**
1	4	1	L1		Language - IV	3	4	50	50	100
2	4	2	L2		English - IV	3	4	50	50	100
3	4	3	Core		Core Course – VII Theory Machine Learning	4	6	50	50	100
4	4	3	Core		Core Course – VIII Theory / Practical Machine Learning Lab	4	4	50	50	100
5	4	3	Allied		Allied-IV Discrete Mathematics	4	5	50	50	100
8	4	3	Elective		Elective - II Web Mining Deep Learning Cloud Computing	4	5	50	50	100
7	4	4	AEC		Ability Enhancement Course IV Soft Skill-2	2	2	50	0	50
8	4	5	Ext		Extension Activity - III (NASA)	1	0	25	0	25
						25	**30**	**375**	**300**	**675**
1	5	3	Core		Core Course – IX Theory Robotic Process Automation	4	6	50	50	100
2	5	3	Core		Core Course – X Theory / Practical Robotics Lab	4	6	50	50	100
3	5	3	Elective		Elective - III Data Mining using R Network Security and Cryptgraphy Design and Analysis of Algorithms	4	6	50	50	100

	5	3	PRJ		Project	0	6	0	0	0
4	5	4	SEC		Skill Enhancement Courses – III Practical / Training Embedded Systems and IoT	4	6	50	50	100
5	5	3	ITR		Internship / Industrial Training (Summer vacation at the end of IV semester activity)	2	0	50	0	50
6	5	5	Ext		Extension Activity - IV (NASA)	1	0	25	0	25
						19	**30**	**275**	**200**	**475**
1	6	3	Core		Core Course – XI Theory Natural Language Processing	4	6	50	50	100
2	6	3	Core		Core Course – XII Theory / Practical Natural Language Processing Lab	4	4	50	50	100
3	6	3	Elective		Elective – IV Fuzzy Logic and Neural Networks Digital Image Processing Human Computer Interaction	4	6	50	50	100
4	6	3	PRJ		Core Project	8	8	100	100	200
5	6	4	SEC		Skill Enhancement Courses – IV Practical / Training Web Technology	4	6	50	50	100
						24	**30**	**300**	**300**	**600**
					Total credit	**144**	**180**	**2100**	**1700**	**3800**

Additional Credits										
S.No.	**Sem**	**Part**	**Sub Type**	**Sub Code**	**Subject**	**Credit**	**Hours**	**INT**	**EXT**	**Total**
1	2	6	VAC		VAC - Microsoft CoE Course	2	2	50	0	50
2	3	6	VAC		Inter Department Course	2	2	50	0	50
3	4	6	IDC		VAC - Microsoft CoE Course	2	2	50	0	50
4	5	6	VAC		VAC - Microsoft CoE Course	2	2	50	0	50

Parts	**Sem I**	**Sem II**	**Sem III**	**Sem IV**	**Sem V**	**Sem VI**	**Total Credits**
Part I	3	3	3	3			12
Part II	3	3	3	3			12
Part III	12	12	15	12	19	20	90
Part IV	2	2	6	6	4	4	24
Part V						2	2
Total	**20**	**20**	**27**	**24**	**23**	**26**	**140**

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
22BGE11T	Part I Tamil	3	6	1	0	Theory

Introduction:

பகுதி முதல் பாடமாக அமையும், தமிழ்ப்பாடம் கவிதைகள், இலக்கணம், இலக்கியவரலாறு ஆகியவைகள் கொண்டு அமைந்து உள்ளது. ஐந்து அலகுகளாக பகுக்கப்பட்டுள்ளது.

Course Outcome:

CO1	:	பாரதியார், பாரதிதாசன், சிற்பி, சுரதா ஆகிய கவிதைகளின் விளக்கத்தை மாணவர்கள் அறிந்து கொள்ளுவதால், தன்னம்பிக்கையை வெளிக்கொணரும் வகையில் உள்ளது.
CO2	:	பெண் கவிஞர்களின் படைப்பு கவிதையை அறிவதன் மூலம் வாழ்வியல் செய்திகளையும், யதார்த்த நிலையும் அறிய உதவுகிறது.
CO3	:	எண்ணங்களே ஏணிப்படிகள் -வாழ்வில் வெற்றி பெற வேண்டுமானால் எண்ணங்களை வளர்ந்துக் கொள்ள வேண்டும். சிந்தனையில் மூழ்கினர்ல் தெளிவு கிடைக்கும் என்ற கருத்துக்களை அறியும் வகையில் அமைந்துள்ளது.
CO4	:	படைப்புத்திறனை வெளிப்படும் விதமாகவும், இலக்கணத்தை அறிய பயனுள்ளதாக அமைகிறது.
CO5	:	இலக்கியவரலாறு பற்றியச் செய்திகளைக் கொண்டு அதன் வளர்ச்சி நிலையை அறிவும் வகையில் உள்ளது

Unit I : [12 periods]

பாரதியார் - பெண் விடுதலை, பாரதிதாசன் - வீரத் தமிழன், சிற்பி – நிலவுப்பூ, சுரதா - நாடு ஆகியவற்றின் விளக்கம் தருதல்

Unit II: [12 periods] தாமரை - தொலைந்துபோனேன், அ. வெண்ணிலா - நீரிலலையும் முகம் மாலதி மைத்ரி - கன்னியாகுமரி, க்ருஷாங்கினி - புன்னை மரம் ஆகிய பெண் கவிதைகளின் செய்திகளை அறிவதால் வாழ்வியல் சூழலையும், யாதர்த்த நிலையையும் விளக்குதல்.
Unit III: [12 periods] எண்ணங்களே ஏணிப்படிகள் - தெளிவான இலக்கு - ஆற்றல் நதி பெருகட்டும் - அறிவை விரிவு படுத்துக்கள் - முன்னேற்றப் படிகள் - வெற்றிச் சிகரம்- எப்பொழுதும் வெற்றி ஆகியவைகள் வாழ்வின் முன்னேற்றதுக்கான செய்திகள் அறியப்பயன்படும்.
Unit IV: [12 periods] பெயர் சொல், வினைச்சொல், இடைச்சொல், உரிச்சொல், எச்சம் - இலக்கணத்திற்கு விளக்கம் அளித்தல் - படைப்பிலக்கியப் பயிற்சி, கவிதை எழுதல் வானொலித் தமிழ், தொலைக்காட்சித் தமிழ், பயன்பாட்டுத்தமிழ், இலக்கண நோக்கில் பயிற்றுவித்தல் எழுதுதல் கவிதை + வானொலி பேச்சுத்திறன் வளர்த்தல். ஆகியவைகள் கொண்டு திறன் வளர்க்க உதவுதல்.
Unit V: [12 periods] இலக்கியவரலாறு பற்றியச் செய்திகள் மற்றும் புதுக்கவிதைகளின் தோற்றங்கள், வளர்ச்சிகள் அறிவும் வகையில் உள்ளது. ஹைக்கூ, குக்கூ, சென்ட்ரியூ, கஜல். ஆகியவற்றுக்கு விளக்கம் தருதல்.
Text books: 1. பாரதியார் கவிதைகள், 2. பாரதிதாசன் கவிதைகள், 3. சுரதா கவிதைகள், 4. சிற்பி கவிதைகள் 5. அ. வெண்ணிலா
Reference Books : 1 இலக்கியவரலாறு பாக்கியமேரி, 2. இலக்கண நூல், 3. மு.வ. தமிழ் இலக்கிய வரலாறு

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
23BGE12E	English for Communication-1	4	0	0	4	Theory

Introduction:

To encourage students to inculcate and use effective communication skills in their day-to-day life. To develop the LSRW skills to enhance the culture and thoughts through language.

Course Outcome:

CO1	:	Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking, and Writing
CO2	:	Understand the total content and underlying meaning in the context
CO3	:	Form the habit of reading for pleasure and for information
CO4	:	Comprehend material other than the prescribed text
CO5	:	Develop the linguistic competence that enables them, in the future, to present the culture and civilization of their nation.

Unit I : [12 periods]

A Patch of Land –Subramania Bharathi, JRD-Harish Bhat, The Faltering Pendulum-BhabaniBhattacharya-Listening for General and Specific Information, Vocabulary: Synonyms, Antonyms, Word Formation

Unit II: [12 periods]

The Sparrow-Paul Lawrence Dunbar, Us and Them-David Sedaris (From Dress your Family in Corduroy and Denium), How I taught my grandmother to read-Sudha Murthy, Appropriate use of /articles and Parts of Speech, Listening to Giving Instructions/Directions

Unit III: **[12 periods]** A Nation's Strength- Ralph Waldo Emerson, Uncle Podger Hangs a Picture-Jerome K.Jerome Self-Introduction, Greeting, Introducing Others, Error Detection
Unit IV: **[12 periods]** Love Cycle , The Gold Frame-R.K Laxman, Communication and its types, Close Reading
Unit V: [12 periods] Translation, Dialogue Writing, Free Writing, Sentence Types
Text books: 1. Steel Hawk and other stories by Bhattacharya, Bhabani, New Delhi Sahitya Akademi, 1967 2. How I Taught my Grandmother to Read and Other Stories, Murthy, Sudha, Penguin Books, India, 2004
Reference Books : 1. English in use - A textbook for College Students (English ,Paperback, - T.Vijay Kumar, K Durga Bhavani, YL Srinivas 2. Practical English Usage - 4th Edition By Michael Swan 3. The Art of Civilized Conversation: A Guide to Expressing Yourself with Style and Grace -Margaret Shepherd, Penny Carter, (Illustrator), Sharon Hogan, 2005.

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	3	3	3	3	3	3	3	2	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2	3	2
CO3	3	3	3	2	3	3	3	2	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2	3	2
CO5	3	2	3	3	3	3	3	2	2	3	3	2

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Allied- Mathematics For Computer Science	**4**	**6**	**-**	**-**	**Core Theory**

Introduction:

This paper focuses on the Mathematical logic, Relations& Functions, Formal languages and Graph Theories

Course Outcome:

CO1	:	To demonstrate a working knowledge of set notation and elementary set theory with its corresponding set operations and also Venn diagram.
CO2	:	To apply the fundamental concepts of Mathematical Logic and Tautologies.
CO3	:	To apply and understand the fundamental concepts of Relations and Functions.
CO4	:	To demonstrate different traversal methods for graphs.
CO5	:	To demonstrate different methods for trees and its properties.

Unit I : **[12periods]**

Set theory – Introduction-Basic definition – Types of sets – Operations on sets –Euler-Venn diagrams – Laws of set theory – Power sets and products – Inclusion and exclusion principle.

Unit II: **[12 periods]**

Mathematical logic – Introduction to propositional logic – Basic logical operations-Tautologies – Contradiction – Predicates and Quantification.

Unit III: **[12 periods]**

Relations – Binary Relations – Set operation on relations – Types of Relations – Partial order relation – Equivalence relation – Composition of relations – Functions – Types of functions – Invertible functions – Composition of functions

Unit IV: **[12 periods]**

Graph theory – Basic terminology – Paths, cycle and connectivity – sub graphs – Types of graphs – Representation of graphs in computer memory.

Unit V: **[12 periods]**

Trees – Properties of Trees – Binary trees – Traversing Binary Trees – Computer Representation of general trees

Text books:

1. Discrete Mathematics for Computer Science by Gary Haggard, JohnSchlipf and Sue Whitesides

Reference Books :

1. Discrete Mathematics by J.K. Sharma second edition – 2005. Macmillan India Ltd.

Course Outcomes	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	M	M	L	L	L	L	L	L
CO2	M	M	L	L	L	L	L	L
CO3	H	M	M	L	L	L	L	L
CO4	H	M	M	L	L	L	L	L
CO5	H	H	M	M	L	L	L	L

H - High; M- Medium; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core - I – Problem Solving Using C	**4**	**6**	**-**	**-**	**Core Theory**

Introduction:

This subject covers the C Programming Course. Throughout this course, students will learn the fundamental and advanced concepts of C programming, enabling them to write efficient and reliable programs for various applications.

Course Outcome:

CO1	:	Understand basic C programming concepts and create simple programs confidently.
CO2	:	Use decision-making and looping tools to solve different problems in programming.
CO3	:	Use advanced methods to make decisions and organize data effectively in programs.
CO4	:	Manage input/output operations and files smoothly in programs.
CO5	:	Organize code effectively using functions and pointers to make programs run better.

Unit I : Introduction to C Programming and Basic Constructs [12 periods]

Getting Started with C - The C Character Set - Constants, Variables, and Keywords - Form of a C Program - Compilation and Execution - The First C Program - C Instructions - Types of Instructions - Type Declaration Instruction - Arithmetic Instruction - Control Instructions -

Types of Operators.
Unit II: Decision Making and Looping Constructs [12 periods] **Decision Control Instruction**: - The if Statement - The if-else Statement - Nested if-else - Use of Logical Operators - The Conditional Operators - **Loop Control Instruction**:- Loops and the while Loop - The for Loop - The do-while Loop - Break and Continue Statements
Unit III: Advanced Decision Making and Data Structures [12 periods] Case Control Instruction - Decisions using switch - Comparison of switch and if-else Ladder - The goto Keyword - Data Types Revisited - The C Pre-processor - Arrays and Multidimensional Arrays - Strings and String Functions - Structures and Array of Structures- Console I/O Functions
Unit IV: Functions, Modular Programming, and Pointers [12 periods] Functions - Introduction to Functions - Passing Values between Functions - Scope Rule of Functions - Using Library Functions - Return Type of Function – Pointers - Call by Value and Call by Reference - Introduction to Pointers - Pointer Notation - Pointers and Arrays - Pointers to Functions - Recursion
Unit V: Input / Output Operations and Structures in C [12 periods] Data Organization - File Operations: Opening a File - Reading from a File - Closing the File - Counting Characters – A File-Copy Program - Writing to a File - File Opening Modes - Text Files and Binary Files - Issues in Input / Output - Operations on Bits
Text books: 1. Yashavant Kanetkar , "Let us C" , Fourteenth Edition, BPB Publication, 2017. 2. E.Balagurusamy, "Programming in ANSI C", Seventh Edition McGraw Hill, 2017
Reference Books : 2. Byron S Gottfried, "Programming with C", Fourth Edition, McGraw-Hill, 2018 3. Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw-Hill, 2021

Course Outcomes	**Program Outcomes**											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	1	2	1	1	1	2	1	1	1	1	1	1
CO2	1	3	1	1	3	3	1	1	1	1	1	1
CO3	1	1	3	2	3	1	1	1	1	1	2	1
CO4	1	1	1	3	3	1	1	3	1	1	2	1
CO5	2	2	1	2	3	1	1	3	1	1	1	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core Practical - I – Problem Solving Using C Lab	**4**	**-**	**-**	**6**	**Core Practical**

Introduction:

This subject, C Programming Lab, will equip you with the foundational knowledge to excel in programming with C. Students will learn to effectively utilize basic constructs, implement arrays, manipulate strings, work with pointers, and understand structures and file processing techniques.

Course Outcome:

CO1	:	Understand and apply C programming constructs effectively.
CO2	:	Develop programs in C using basic constructs proficiently.
CO3	:	Implement arrays in C programs for various applications.
CO4	:	Utilize strings, pointers, and functions proficiently in C applications.
CO5	:	Implement structures and file processing techniques effectively in C applications.

1. Create a program that calculates the area of a circle given its radius.
2. Implement a program that determines whether a given year is a leap year or not.
3. Display whether the entered number is an Armstrong number or not
4. Create a program that compares three numbers and prints the largest one.
5. Write a program to print the Fibonacci series up to a certain number of terms using a while loop.
6. Write a program that takes an integer input n and prints a triangle pattern with n rows, where each row contains one more asterisk(*) than the previous row.
7. Write a program to find the sum of elements in a one-dimensional array.
8. Implement a program to count the number of vowels in a given string.
9. Create a program to reverse a given string.
10. Write a function that receives marks received by a student in 3 subjects and returns the average and percentage of these marks. Call this function from main( ) and print the results in main( ).
11. Write a program to swap two numbers using pointers.
12. Write a program to calculate the factorial of a number using a recursive function.
13. Write a program to store and display information about students using structures.
14. Write a program to read data from a file and display it on the screen.
15. Write a program to copy contents of one file to another. While doing so replace all lowercase characters to their equivalent uppercase characters.

Text books:

1. Yashavant Kanetkar , “Let us C” , Fourteenth Edition, BPB Publication, 2017.

Reference Books :

1. Herbert Schildt, “C: The Complete Reference”, Fourth Edition, McGraw-Hill, 2021
2. Byron S Gottfried, “Programming with C”, Fourth Edition, McGraw-Hill, 2018
3. E.Balagurusamy, “Programming in ANSI C”, Seventh Edition McGraw Hill, 2017

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	1	3	1	1	1	2	1	1	1	1	1	1
CO2	1	3	1	1	1	3	1	1	1	1	1	1
CO3	1	1	2	3	3	1	1	1	1	1	2	1
CO4	1	1	1	3	3	1	1	3	1	1	2	1
CO5	1	1	1	3	3	1	1	3	1	1	1	1

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Database Management System	4	5	-	-	**Core Theory**

Course Introduction

This course enables the student skills and knowledge to tackle complex database challenges, optimize database performance, and design efficient database solutions using advanced DBMS and SQL techniques.

Course Outcomes	On completion of this course, students will
CO 1:	To provide a basic introduction about DBMS. To Understand the DBMS.
CO 2:	To Provide an overview of ER Diagrams and the Relational model. To Understand key constraints in DBMS.
CO 3:	Understand the various Normalization and implementations.
CO 4:	Explain DB applications, embedded SQL and overview of storage and indexing.
CO 5:	Understand the concept of ACID properties and Physical Database and Tuning.

Unit I:	**Overview of Database Systems**	**[12 Periods]**

Introduction - Overview of Database Management - What is Database System - History of DBMS - Managing Structured Data - File Systems vs. DBMS - Basics of DBMS – DBMS Architecture -Overview of Relational Model - Database languages – Queries - Transaction Management - Structure & Design of a DBMS - Object Relational and semi-structured DB - Users & Administrators- Client/Server Architecture - Case Study.

Unit II:	**Database Design Models**	**[12 Periods]**

The Relational Model - Relational Calculus - Introduction to Database Design - ER Diagrams – Entities, Attributes and Relationships. Design with ER Model - Conceptual Design for Large Enterprises - UML - Case Study.

Relational Model: The Relational Model Integrity Constraints - Key Constraints – Primary Key Constraints - Foreign Key Constraints - General Constraints - Relational Algebra- Selection and Projection- Set Operation - Relational Calculus - Tuple Relational Calculus- Domain Relational Calculus - Case Study.

Unit III:	**Schema Refinement and Normal Forms**	**[12 Periods]**

DB Design - Normal forms and Atomic Domain- Functional Dependencies and Decomposition - Database Design Process

SQL: SQL queries – Union – Intersect - and Except - Nested Queries – Aggregate Queries- Null values- Joins – Views - Stored Procedures - User defined Functions – Triggers – Transactions - Case Study

Unit IV:	**DB Application Development**	**[12 Periods]**

DB Access from applications – embedded SQL, Cursors, and Dynamic SQL. Introduction to JDBC & SQL/J - Stored Procedures.

Overview of Storage and Indexing: Data on external storage - File Organizations and Indexing - Index Data Structures - Comparison of File Organizations - Indexes and Performance Tuning.

Overview of Query Evaluation: System Catalog - Operator Evaluation - Algorithms for relational operations. Introduction to Query Optimization – Alternative Plans - Case Study.

Unit V:	**Transaction Management**	**[12 Periods]**

Introduction to Transaction - ACID Properties Serializability- Transactions and Schedules - Concurrent Execution of Transactions - Lock-based concurrency control - Transaction support in SQL commit - rollback – save point - Introduction to Crash Recovery.

Physical Database Design and Tuning: Introduction to Physical Database design - Index Selection - Clustering. Overview of Database Tuning - Choices in tuning queries and Views - Case Study

Text Books:

1. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke 3rd Edition, McGraw Hill 2003.
2. Database System Concepts, AbrahamSilberschatz, Henry F.Korth and S.Sudarshan, 5th Edition, McGraw Hill 2006.

Reference Books:

1. Fundamentals of Database Systems, Elmasri and Navathe, 5thEdition, Addison-Wesley, 2007.
2. An Introduction to Database Systems, C.J. Date, A. Kannan, S. Swamynatham, 8th Edition, Pearson education, 2006.

Web Resources:

1. https://www.javatpoint.com/dbms-tutorial
2. https://www.appdynamics.com/topics/database-management-systems

Mapping of Course Outcome with Programme Outcome and Programme Specific Outcome:

Course Outcome	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	2	1	1	1	2	1	1	1

Course Code	Couse Title	Credit	Lecture	Tutorial	Practical	Type
	Database Management System Lab	**4**	**0**	**0**	**5**	**Practical**

List of Practical Programs:

1. Practical Based on Data Manipulation.
   • Adding data with Insert, • Modify data with Update, • Deleting records with Delete

CO2	3	3	3	1	1	3	2	1	2	1	1	1
CO3	3	3	3	1	2	2	1	3	2	1	3	1
CO4	2	1	3	2	1	3	2	3	1	2	2	2
CO5	3	1	3	1	2	2	2	3	2	2	2	1

2. Practical Based on Implementing the Constraints.
   • NULL and NOT NULL, • Primary Key and Foreign Key Constraint • Unique, Check and Default Constraint
3. Practical for Retrieving Data Using following clauses.
   • Simple select clause, • Accessing specific data with Where, Ordered By, Distinct and Group By
4. Practical Based on Aggregate Functions.
   • AVG, • COUNT, • MAX, • MIN, • SUM, • CUBE
5. Practical Based on implementing all String functions.
6. Practical Based on implementing Date and Time Functions.
7. Practical Based on implementing use of union, intersection, set difference.
8. Implement Nested Queries & JOIN operation.
9. Practical Based on performing different operations on a view.
10. Practical Based on implementing use of triggers, cursors & procedures.

Mapping of Course Outcome with Programme Outcome and Programme Specific Outcome:

Course Outcome	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	1	1	2	1	1	1
CO2	2	2	3	1	2	3	2	1	2	1	1	1
CO3	3	3	2	1	1	2	1	3	2	1	2	1
CO4	1	1	3	3	1	2	2	3	1	2	2	2
CO5	3	1	3	1	3	2	2	3	1	2	2	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Value Added Course - Foundations of Full Stack Web Development	**2**	**3**	**-**	**0**	**Theory & Practical**

Introduction: To become knowledgeable about the most recent web development technologies. Idea for creating two tier and three tier architectural web applications. Design and Analyse real time web applications. Constructing suitable client and server side applications. To learn core concept of both front end and back end programming.

CO1	:	Develop a fully functioning website and deploy on a web server.
CO2	:	Gain Knowledge about the front end and back end Tools.
CO3	:	Find and use code packages based on their documentation to produce working results ina project.
CO4	:	Create web pages that function using external data.
CO5	:	Implementation of web application employing efficient database access.

Unit I: **[5 hours]**

Web Development Basics: Web development Basics - HTML & Web servers Shell - UNIX CLI Version control - Git &Github HTML, CSS.

Unit II : **[5 hours]**

Frontend Development: Javascript basics OOPS Aspects of JavaScript Memory usage and Functions in JS AJAX for data exchange with server jQuery Framework jQuery events, UI components etc. JSON data format

Unit III: **[5 hours]**

REACT JS: Introduction to React React Router and Single Page Applications React Forms, Flow Architecture and Introduction to Redux More Redux and Client-Server Communication

Unit IV: **[5 hours]**

Java Web Development: JAVA PROGRAMMING BASICS, Model View Controller (MVC) Pattern MVC Architecture using Spring RESTful API using Spring Framework Building an application usingMaven

Unit V: **[5 hours]**

Databases & Deployment: Relational schemas and normalization Structured Query Language (SQL) Data persistence using Spring JDBC Agile development principles and deploying application in Cloud.

Text Book:

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett ProfessionalJavaScript for Web Developers Book by Nicholas C. Zakas
2. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-byStep Guide to CreatingDynamic Websites by Robin Nixon
3. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015 BYAZAT MARDAN

Reference Books:

1. Full-Stack JavaScript Development by Eric Bush
2. Mastering Full Stack React Web Development Paperback – April 28, 2017 by TomaszDyl , Kamil Przeorski , Maciej Czarnecki

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
21T	Part I Tamil	**3**	**6**	**1**	**0**	**Theory**

Introduction:

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Course Outcome:

CO1	:	□□.	
CO2	:	□□ற்□□.	
CO3	:	□□.	
CO4	:	□□ற்□□.	
CO5	:	□□ற்□□.	

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Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
22E	**General English**					

Introduction: To encourage students to inculcate and use effective communication skills in their day-to-day life. To develop the LSRW skills to enhance the culture and thoughts through language

Course Outcome:

CO1	:	Learn to introduce themselves and talk about everyday activities confidently
CO2	:	Be able to write short paragraphs on people, places, and events
CO3	:	Identify the purpose of using various tenses and effectively employ them in speaking and writing
CO4	:	Gain knowledge to write subjective and objective descriptions
CO5	:	Identify and use their skills effectively in formal contexts.

[12 Hours]

Unit I:

1.1 Very Indian Poem in Indian English -Nissim Ezekiel - 1.2 If you Are Wrong Admit it-Dale Carnegie - 1.3 Reading for General and Specific Information (Charts, tables schedules, graphs, etc.) - 1.4 Homonyms, Homophones, Homographs

[12 Hours]

Unit II:

2.1 Still I Rise- Maya Angelou - 2.2 Kindly Adjust Please- Shashi Tharoor - 2.3 Verbs and Tenses

2.4 Subject Verb Agreement

[12 Hours]

Unit III:

3.1 Alchemist-Paulo Coelho

[**12 Hours]**

Unit IV:

4.1 The Flower- Tennyson - 4.2 The Spoon-Fed Age. W.R. Inge - 4.3 Paragraph Writing - 4.4 Error detection

[12 Hours]

Unit V:

5.1 On Killing a Tree- Gieve Patel - 5.2 Taking and Note Making - 5.3 Reading news and weather reports

5.4 Precis Writing.

Text books:

1. The Alchemist - Paulo Coelho Harper - 2005

Reference Books :

1 Advanced English Grammar. Martin Hewings. Cambridge University Press, 2000
2. Descriptive English. SP Bakshi, Richa Sharma • 2019, Arihant Publications (India) Ltd.
3. The Reading Book: A Complete Guide to Teaching Reading. Sheena Cameron, Louise Dempsey, S & L. Publishing, 2019.
4. Skimming and Scanning Techniques, Barbara Sherman, Liberty University Press, 2014
5 Brilliant Speed Reading: Whatever you need to read, however ...Phil Chambers

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	1	3	1	1	1	2	1	1	1	2	1	2
CO2	2	3	1	1	1	3	2	1	1	1	1	1
CO3	1	1	2	1	3	1	1	1	2	2	2	1
CO4	2	1	1	2	1	2	1	3	1	1	2	2
CO5	1	2	1	1	3	1	1	3	2	2	1	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Python Programming	**4**	**5**	**-**	**0**	**Theory**

Introduction: After learning the Syntax and Semantics and create Functions, Handle Strings and Files, Understand Lists, Dictionaries and Regular expressions, Implement Object Oriented Programming concepts, Build Web Services and introduction to Network and Database Programming students are able to develop rich dynamic websites in Python.

Course Outcome:

CO1	:	Examine Python syntax and semantics and be fluent in the use of Python flow control and functions
CO2	:	Demonstrate proficiency in handling Strings and File Systems
CO3	:	Understand Lists, Dictionaries and Regular expressions in Python
CO4	:	Interpret the concepts of Object-Oriented Programming as used in Python
CO5	:	Implement exemplary applications related to Network Programming, Web Services and Databases in Python

Unit I:

[12 periods]

Installing Python, Simple program using Python, Expressions and Values, Variables and Computer Memory, error detection, Multiple line statements, Designing and using functions, functions provided by Python, Tracing function calls in memory model, omitting return statement. Working with Text: Creating Strings of Characters, Using Special Characters in Strings, Creating a Multiline String, Printing Information, Getting Information from the Keyboard.

Unit II :

[12 periods]

A Boolean Type , Choosing Statements to Execute, Nested If Statements , Remembering the Results of a Boolean Expression Evaluation , A Modular Approach to Program Organization, Importing Modules , Defining Your Own Modules, Testing Code Semi automatically Grouping Functions Using Methods: Modules, Classes, and Methods , Calling Methods the Object-Oriented Way, Exploring String Methods, Underscores.

Unit III:

[12 periods]

Storing Collections of Data Using Lists: Storing and Accessing Data in Lists, modifying Lists, Operations on Lists, Slicing Lists, Aliasing, List Methods, Working with a List of Lists. Repeating Code Using Loops: Processing Items in a List, Processing Characters in

Strings, Looping Over a Range of Numbers, Processing Lists Using Indices, Nesting Loops in Loops, Looping Until a Condition Is Reached, Repetition Based on User Input, Controlling Loops Using Break and Continue Reading and Writing.

Unit IV:

[12 periods]

Files: Kinds of files, opening a File, Techniques for Reading Files, Files over the Internet, Writing Files, and Writing Algorithms That Use the File-Reading Techniques, Multiline Records. Storing Data Using Other Collection Types: Storing Data Using Sets, Storing Data Using Tuples, Storing Data Using Dictionaries, inverting a Dictionary, Using the In Operator on Tuples, Sets, and Dictionaries, Comparing Collections.

Unit V:

[12 periods]

Collection of New Information Object-Oriented Programming : Understanding a Problem Domain , Function "Isinstance," Class Object, and Class Book , Writing a Method in Class Book, Plugging into Python Syntax: More Special Methods, Creating Graphical User interface: Building a Basic GUI, Models, Views, and Controllers, Customizing the Visual Style Introducing few more Widgets, Object-Oriented GUIs, Keeping the Concepts from Being a GUI Mess.

Reference Books:

1. L. Halterman, "Fundamentals of Python Programming", Southern Adventist University July 26, 2018, Copyright © 2017 Richard L. Halterman Richard.
2. John V Guttag, ―Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, ―Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,, 2015.
5. Kenneth A. Lambert, ―Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
6. Charles Dierbach, Introduction to Computer Science using Python: A Computational ProblemSolving Focus, Wiley India Edition, 2013

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	1	3		3		2				3	3		3
CO2		2	3		1		3	2	3				
CO3	2	1	2			1				2	1	3	2

CO4	**3**			**1**	**3**	**3**			**1**	**3**		**1**	**3**
CO5		**3**			**2**		**2**	**3**					

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Python Programming Lab	**4**	**0**	**-**	**5**	**Lab**

Introduction: Understand the basic operations and creations of various applications using python.

Course Outcome:

CO1	:	Write, test, and debug simple Python programs.
CO2	:	Implement Python programs with conditionals and loops for stack, sorting algorithms.
CO3	:	Read and write data from/to files in Python.
CO4	:	Use Python lists, dictionaries for representing compound data.
CO5	:	Write Script to SQL and Demonstrate Exception in Python.

Lab Experiments:

1. Create a calculator program using Python.
2. Create Python program using different String functions.
3. Implement Selection sort algorithm using Python Program.
4. Implement stack Operation using Python Program.
5. Read and Write into a file using Python Program.
6. Demonstrate use of Dictionaries in Python Program.
7. Create Comma Separate Files (CSV), Load CSV files into internal Data Structure.
8. Write script to work like a SQL SELECT statement for internal Data Structure made in earlier exercise.
9. Write script to work like a SQL Inner Join for an internal Data Structure made in earlier exercise.
10. Demonstrate Exceptions in Python.

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	3				3		3		3		3		3
CO2	2	3		2	3	2		3				3	
CO3	3	2	3			3	2		2	1	3		1
CO4			2	3	3					1		2	2
CO5	1	3		1		2	2		3		1		

Subject Code	Subject Title	Credit	Tutorial	Practical	Lecture	Type
	Allied-II Numerical Methods	**4**	**0**	**0**	**4**	**Core**

Goal: This paper enables the students to learn numerical approximation strategies and a basic knowledge on the theory that supports numerical algorithms.

Course Outcomes:

CO1	:	To demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problem
CO2	:	To apply numerical methods to obtain approximate solutions to mathematical problems
CO3	:	To analyse and evaluate the accuracy of common numerical methods
CO4	:	To analyse error obtained in the numerical solution of the problem
CO5	:	To apply numerical methods in modern scientific computing with finite precision computation.
CO6	:	To relate the subject knowledge with their experiments during their course of study.

UNIT 1: [12 Periods]

Solutions of algebraic and transcendental equations: Introduction – Bisection method – The Iteration method – Newton-Raphson Method – Ramanujan's method.

UNIT 2: [12 Periods]

Interpolation – Errors in Polynomial interpolation, Finite differences, Differences of a polynomial, Newton's forward and backward interpolation, Central differences, Gauss, Stirling, Bessel's and Everett's Formulae, Lagrange's Interpolation formula.

UNIT 3: [12 Periods]

Linear systems of equations: Consistency of Linear System of equations, Solutions of Linear Systems by direct method: Gaussian elimination, Gauss Jordan, solution of tridiagonal systems, Solutions of linear systems by iterative methods: Jacobi method, Gauss-Seidel method.

UNIT 4: [12 Periods]

Numerical integration: Trapezoidal rule – Geometrical interpretation and error of Trapezoidal rule – Simpson's one third rule and three eighth rule formulae - Romberg integration.

UNIT 5: [12 Periods]

Numerical solution for ordinary differential equation-Solution of first order ODE by Taylor series method – Solution of first order ODE by Euler method – Error estimates for the Euler method – Modified Euler method – Runge-Kutta method of second, third and fourth order.

Text Book :

1.Introductory Methods Numerical Analysis, S. S. Sastry Fifth Edition, Prentice-Hall Of India.

Reference:

1. Bipin C. Desai "An Introduction to Database Systems", Galgotia Publication, 2010.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson

Education. 2016.

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	1	3	1	1	1	2	1	1	1	2	1	2
CO2	2	3	1	1	1	3	2	1	1	1	1	1
CO3	1	1	2	1	3	1	1	1	2	2	2	1
CO4	2	1	1	2	1	2	1	3	1	1	2	2
CO5	1	2	1	1	3	1	1	3	2	2	1	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical
	Elective I - Entrepreneurial Development	**4**	**6**	**-**	**-**

Introduction:

To build the necessary competencies and creativity and prepare them to undertake entrepreneurship as a desirable and feasible career option.

Course Outcome:

CO1	:	To know about the role of the entrepreneur in India and around and the globe, understand the benefits and drawbacks of entrepreneurship and students has to avoid them; entrepreneurial failure.
CO2	:	CO2 : The course aims to develop student's ability to create, lead and coordinate projects within the textile and fashion sector. It also intends to provide tools and methods in order to make use of entrepreneurial thinking to develop a business project.
CO3	:	CO3 : Students will be able to define, identify and/or apply the principles of new venture financing, growth financing, and growth financing for existing businesses.
CO4	:	CO4 : To understand process of women entrepreneur and how faced their problems
CO5	:	CO5 : To understand difference between Micro, small and medium Enterprise

Unit I : **[12 periods]**

Entrepreneur – importance- qualities, nature types – difference between entrepreneur and entrepreneurship and economic development – its importance – role of entrepreneurship – entrepreneurial environment.

it II: **[12 periods]**

Project management: sources of business idea – project classifications – identifications – formulation and design – feasibility analysis – preparation of project report and presentation. Financial analysis – concept and scope project cost estimate – operating revenue estimate – ratio analysis – investment.

Unit III: **[12 periods]**

Project finance: sources of finance – institutional finance – role of IFC, IDBI, ICICI, LIC, SFC, SIPCOT, commercial bank – appraisal of bank for loans. Institutional aids for entrepreneurship development

Unit IV: **[12 periods]**

the diagnosis – the consultation of group – selecting a strategy preparing the organization setting up the investment. Women entrepreneur – problems face by women entrepreneur – economic impact of women entrepreneur

Unit V: **[12 periods]**

Setting small scale industries – step in setting SSI unit – problems of entrepreneur – sickness in small industries – reason and remedies – Incentives and subsidies role of DICS, SIDCO, NSICS, IRCI, NIDC, SIDBI, SISI, SIPCOT.

Text books:

1. . Robert D. Hisrich, Mathew J Manimala, Michael P Peters, Dean A Shepherd, "Entrepreneurship", McGraw Hill Education, 2014

Reference Books :

2. Bhushan Y.K, "Entrepreneurial Development" Sultan Chand & Sons, Nineteenth Edition -2013.
3. L.M. Prasad, "Entrepreneurial Development", 5th Edition, Himalaya publication, Mumbai – 2006.

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	1	3	1	1	1	2	1	1	1	2	1	2
CO2	2	3	1	1	1	3	2	1	1	1	1	1
CO3	1	1	2	1	3	1	1	1	2	2	2	1
CO4	2	1	1	2	1	2	1	3	1	1	2	2
CO5	1	2	1	1	3	1	1	3	2	2	1	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Value Added Course - IoT Essentials: A Beginner's Guide	**2**	**3**	**-**	**-**	**Theory & Practical**

Unit I: Introduction to IoT and Development Setup [5 Hours]

Introduction to IoT: Overview and applications of IoT. - Setting Up the Development Environment: Installing and configuring Arduino/Raspberry Pi. - Basic programming (C/C++, Python) - Basic Concepts and Practices: Blinking an LED - Reading a button press.

Unit II: Working with Basic Sensors [5 Hours]

Humidity and Smoke Sensors: -Interfacing with humidity and smoke sensors - Light and Distance Sensors: Interfacing with light sensors - Interfacing with distance sensors.

Unit III: Display Modules and Additional Sensors [5 Hours]

LCD Display - Displaying data on an LCD screen - Vibration and Tilt Sensors: Basics and interfacing. RFID and Touch Sensors - Interfacing with RFID and touch sensors.

Unit 4: Advanced Sensors and Actuators: [5 Hours]

Weight and Soil Moisture Sensors - Interfacing with weight sensors - Interfacing with soil moisture sensors -Interfacing Water Pumps: Controlling water pumps.

Unit 5: Data Collection, Cloud Integration, and Security: [5 Hours]

Data Logging and Cloud Integration - Storing sensor data locally and remotely. - Introduction to cloud services for IoT - Security in IoT - Basics of IoT security.

Text books:

1. Bahga, Arshdeep, and Vijay Madisetti. Internet of Things: A hands-on approach. Vpt, 2014.

Reference Books :

1. Buyya, Rajkumar, and Amir Vahid Dastjerdi, eds. Internet of Things: Principles and paradigms. Elsevier, 2016.

31T	Part I Tamil	**3**	**6**	**1**	**0**	**Theory**

Introduction: மூன்றாம் பருவப் பாடத்திட்டம் சிறுகதை, வானொலி, தொலைக்காட்சி, கணிப்பொறி, மொமிப்பெயர்ப்பு ஆகியவைகள் கொண்டு உருவாகியுள்ளது.

Course Outcome:

CO1	:	சிறுகதை எழுதுதல்- சிறுகதையின் வடிவம் மையக்கதாபாத்திரம். பயனுள்ளதாக அமையும். சிறுகதை இலக்கணம் அறிதல், தலைப்பு, கதைக்களம் சிறுகதையின் அமைப்பு அறிந்து கொள்ள முடிகிறது.
CO2	:	வானொலியில் இடம் பெறும் நிகழ்ச்சிகள் - தமிழ் சார்ந்த பேச்சு, விவாதம், மாணவர்கள் அறிந்து கொள்ள பயன் உள்ளது.
CO3	:	தொலைக்காட்சியின் இயல்பு-தொலைக்காட்சியின் நன்மைகள், நிகழ்ச்சி தயாரிக்கும் முறை- நிகழ்ச்சி ஒருங்கிணைப்புகள், நிகழ்;ச்சி நடத்துதல்.
CO4	:	கணிப்பொறி வரலாறு- கணிப்பொறி வகைகள்,. கணிப்பொறி பயன்பாடுகள் ஆகியவைகள் மாணவர்களுக்கு பயனுள்ளது.
CO5	:	மொழிப்பெயர்ப்;பு வரலாறு, மொழிபெயர்ப்பு இயல்புகள் மற்றும் முக்கியத்துவம் பற்றித் தெளிவாக புரிந்து கொள்ள முடியும்.

அலகு I : [12 **பாட வகுப்புகள்**]

சிறுகதை எழுதுதல் - சிறுகதையின் வடிவம். மையக்கதாபாத்திரம், எதிர் கதாபாத்திரங்கள். சிறுகதை இலக்கணம் அறிதல், தலைப்பு கதைக்களம் சிறுகதையின் அமைப்பு சிறுகதை பயன்பாடு, சிறுகதையின் தொடக்கம் தெளிவுரையுடன் விளக்கம் கொடுத்து கற்பிக்கப்படும்.

அலகு II : [12 **பாட வகுப்புகள்**]

வானொலி வரலாறு. வானொலி பயன்பாடு, வானொலியில் இடம் பெறும் நிகழ்ச்சிகள் - தமிழ் சார்ந்த பேச்சு, விவாதம்,பட்டிமன்றம். வானொலியில் கல்வி ஒலிபரப்பு, வேலைவாய்ப்பு, வேளாண்மை நிகழ்ச்சிகள், மருத்துவக் குறிப்புகள் ஆகியவைகள் பற்றி விளக்கம் மற்றும் பேச்சுக்கலைகள் வளர்க்க கற்றுக்கொடுக்கப்படும்.

அலகு III: [12 **பாட வகுப்புகள்**]

தொலைக்காட்சியின் வரலாறு-தொலைக்காட்சி தன்மைகள், இயல்பு, நன்மைகள், நிகழ்ச்சி தயாரிக்கும் முறை-நிகழ்ச்சி ஒருங்கிணைப்புகள், நிகழ்ச்சி நடத்துதல். தொலைக்காட்சி வர்ணனைகள் விருதுகள், நிகழ்ச்சிகள் ஆகியவைகள் பற்றி விளக்கம் தருதல்.

அலகு IV: [12 **பாட வகுப்புகள்**]

கணிப்பொறி வரலாறு- கணிப்பொறி வகைகள், கணிப்பொறி பயன்பாடுகள், மாத.

நாட்காட்டி தயாரித்தல் விளம்பரம் உருவாக்கம், மதிப்பெண் பட்டியல்

தயாரித்தல், கணினி கலைச்சொல்லாக்கம் விளக்கம் கொடுத்து கற்பிக்கப்படும்.
அலகு V : [12 **பாட வகுப்புகள்**] மொழிப்பெயர்ப்பு வரலாறு, இயல்புகள் பயன் ஆகியவைகள் அறிந்து கொள்ள பயிற்சிகள் கொடுத்து கற்பிக்கப்படும்.
பாடநூல்கள்: 1. எழுதுவது எப்படி- மகரம் வாசகர் வட்டம், 2. தமிழ் இணைய இதழ்கள் - அண்ணா கண்ணன் 3. .மொழிபெயர்ப்புக்கலை : மு.வளர்மதி, 4. மொழிபெயர்ப்பியல் : சு.சண்முக வேலாயுதம், 5. மொழி பெயர்ப்பும், சொல்லாக்கமும் தென்புலோலியூர், மு.கணபதிப்பிள்ளை

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
32E	**General English**					

Introduction: To encourage students to inculcate and use effective communication skills in their day-to-day live develop the LSRW skills to enhance the culture and thoughts through language

Course Outcome:

CO1	:	Broaden their outlook and sensibility and be acquainted with cultural diversity and divergence in perspectives.
CO2	:	Be updated with basic informatics skills and attitudes relevant to the emerging knowledge society
CO3	:	Produce grammatically and idiomatically correct language
CO4	:	Gain knowledge in writing techniques to meet academic and professional needs
CO5	:	Be equipped with sufficient practice in Vocabulary, Grammar, Comprehension and Remedial English from the perspective of career-oriented tests.

12 Hours

Unit I:

1.1 The Voice of the Mountains -Mamang Dai - 1.2 Romeo & Juliet- The Balcony Scene - 1.3 Writing and Emails - 1.4 Data Interpretation and Reporting

12

Unit II:

2.1 Sita- Toru Dutt - 2.2 Macbeth-Banquet Scene - 2.3 Writing and messaging on Social Media Platforms (Twitter, Instagram, Facebook)

`12 Hours

Unit III:

3.1 A Song of Hope- Oodgeroo Noonuccal - 3.2 Julius Caesar- Murder Scene - 3.3 Tryst with Destiny-Jawa Nehru - 3.4 Learning netiquette, email etiquette

12 Hours

Unit IV:

4.1 In an Artist's Studio- Christina Rossetti - 4.2 Yes, We Can Barack Obama - 4.3 Meeting Etiquettes- Language dress code, voice modulation. - 4.4 Online Meetings- Terms and expressions used - 4.5 Framing Questions

12

Unit V:

5.1 You've Got to Find What You Love- Steve Jobs - 5.2 Group Discussion - 5.3 Conducting and participa meetings - 5.4.Voices

Text books:

1. Arden Shakespeare Complete works by Shakespeare (Author), William (Author), Bloomsbury, 2011

Reference Books :

1. The Shakespeare Book. Big Ideas Simply Explained, Stanley Wells et al. DK Publishing, 2015
2. Famous Speeches by Mahatma Gandhi, Creatingspace Independent Publishing Platform,2016
3. How to Build a Professional Digital Profile Kindle Edition
4. by Jeanne Kelly Bernish, Bernish Communications Associates, LLC; 1st edition (May 29, 2012)
5. Keys to Teaching Grammar to English Language Learners, Second Ed.: A Practical Handbook by Keith S Fol Michigan Teacher Training, 2016

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core Course – V Theory Artificial Intelligence	**4**	**4**	**0**	**0**	**Theory**

Introduction:

To expose the student sort the fundamental concepts of Artificial Intelligence and its applications.

Course Outcome:

CO1	:	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
CO2	:	Understanding about the basic concepts of Software agents ad representation of knowledge
CO3	:	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
CO4	:	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
CO5	:	Design, implement, and evaluate AI solutions using contemporary tools and frameworks, ensuring effective deployment and integration in various domains.

Unit I: Introduction **[12 periods]**

Introduction – Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents – Typical Intelligent Agents – Problem Solving Approach to Typical AI Problems

Unit II: Problem Solving Methods **[12 periods]**

Problem Solving Methods – Search Strategies – Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games.

UnitIII: KnowledgeRepresentation **[12periods]**

Knowledge Representation – First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining – Backward – Chaining – Resolution – Knowledge Representation – Ontological Engineering – Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information

Unit IV: Software Agents **[12 periods]**

Software Agents – Architecture for Intelligent Agents – Agent Communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent Systems.

Unit V:AI Applications

AI Applications – Language Models – Information Retrieval – Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning - Moving.

Text books:

1. S. Russell and P. Norvig, ―Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.
2. I. Bratko, - Prolog: Programming for Artificial Intelligence, Fourth Edition, Addison-Wesley Educational Publishers Inc., 2011.

Reference Books :

1. M. Tim Jones, - Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers Inc.; First Edition, 2008.
2. Nils J. Nilsson, - The Quest for Artificial Intelligence, Cambridge University Press, 2009
3. William F. Clocksin and Christopher S Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.

Course Outcomes		Program Outcomes						
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	3	1	1	1	1	1	1	1
CO2	1	1	1	1	1	1	1	1
CO3	2	1	2	2	1	1	1	1
CO4	3	3	2	2	1	1	1	1
CO5	1	1	1	2	1	1	1	1

Subject Code	Subject Title	Credit	Tutorial	Practical	Lecture	Type
	Core Course –VI Theory / Practical Artificial Intelligence Lab	**4**	**0**	**0**	**4**	**Core**

Introduction: This course provides a comprehensive introduction to the field of Artificial Intelligence (AI). It covers fundamental concepts and techniques used in AI, including search strategies, game playing, constraint satisfaction problems (CSPs), logical reasoning, probabilistic reasoning, and machine learning. Through a combination of theoretical foundations and practical implementations, students will gain the skills necessary to design and develop AI systems that can solve complex problems.

Course Outcome:

CO1	:	Design and implement various search strategies to solve problems.
CO2	:	Implement game playing algorithms and techniques for solving constraint satisfaction problems.
CO3	:	Develop systems that utilize logical reasoning for decision-making.
CO4	:	Construct probabilistic reasoning models for dealing with uncertainty.
CO5	:	Develop and analyze machine learning models for data-driven applications.

LIST OF PRACTICALS

1. Implement basic search strategies 8-puzzle problem
2. Implement basic search strategies – 8-Queens Problem
3. Implement basic search strategies – Crypt arithmetic
4. Implement A* Algorithm
5. Implement Mini-Max algorithm for game playing (Alpha-Beta pruning)
6. Solve constraint satisfaction problems
7. Propositional Model Checking Algorithms
8. Implement Forward Chaining Algorithm
9. Implement backward Chaining Algorithm
10. Implement Naïve Bayes Models
11. Implement Bayesian Networks and perform inference

Course Outcomes	**Program Outcomes**							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	1	3	2	2	1	1	1	1
CO2	1	3	2	2	1	1	1	1
CO3	1	3	3	2	1	1	1	1
CO4	1	3	3	2	2	1	1	1
CO5	1	3	3	2	3	2	1	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Skill Enhancement Courses – I Practical / Training **Mobile Application Development**	**4**	**6**	**0**	**0**	**Theory**

Course Introduction:

This subject covers the mobile application development in the process of making software for smartphones, tablets and digital assistants, most commonly for the Android and iOS operating systems. The software can be preinstalled on the device, downloaded from a mobile app store or accessed through a mobile web browser.

Course Focus on: Skill Development / Entrepreneurship / Employability / Research

Course Outcome:

CO1	:	Identify various concepts of mobile programming that make it unique from programming for other platforms.
CO2	:	Critique mobile applications on their design pros and cons
CO3	:	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces
CO4	:	Program mobile applications for the Android operating system that use basic and advanced phone features
CO5	:	Deploy applications to the Android marketplace for distribution.

Unit I : [12 periods]

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file

Unit II: [12 periods]

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

Unit III: **[12 periods]** Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.
Unit IV: **[12 periods]** Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.
Unit V: **[12 periods]** Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.
Text books: 1.T1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
Reference Books : 1. R1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd 2. R2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd 3. R 3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	1	3	1	1	1	2	1	1	1	2	1	2
CO2	2	3	1	1	1	3	2	1	1	1	1	1
CO3	1	1	2	1	3	1	1	1	2	2	2	1
CO4	2	1	1	2	1	2	1	3	1	1	2	2
CO5	1	2	1	1	3	1	1	3	2	2	1	1

Subj	Subject Title	Credi	Lecture	Tutori	Practi	Type

ect Code		t		al	cal	
	Value Added Course - Understanding Blockchain Technology	**2**	**3**	**-**	**-**	**Theory & Practical**

Introduction:

This course is intended to study the basics of Understanding Blockchain technology. During this course the learner will explore various aspects of Blockchain technology like application in various domains. By implementing, learners will have idea about private and public Blockchain, and smart contract.

Course Outcome:

CO1	:	Understand the history and fundamental concepts of blockchain technology, including digital money, distributed ledgers, and the basic crypto primitives such as hash functions and digital signatures.
CO2	:	Analyze and evaluate various consensus mechanisms used in blockchain, with a focus on proof of work and scalability in both permissioned and permission less blockchains.
CO3	:	Understand and implement the components and chain code in Hyperledger Fabric, including the use of SDK and front-end tools like Hyperledger Composer.
CO4	:	Apply blockchain technology in financial software and systems, including settlements, KYC, capital markets, insurance, and trade/supply chain management.
CO5	:	Explore the use of blockchain in government applications, focusing on digital identity, land records, record-keeping, and public distribution systems, with an emphasis on privacy and security.

Unit I: **[5 periods]**

History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy-: Block chain Architecture and Design-Basic crypto primitives: Hash, Signature- Hash chain to Block Chain-Basic consensus mechanisms.

Unit II: **[5 periods]**

Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Block chain consensus protocols**:** Permissioned Block Chains-Design Goals-Consensus protocols for Permissioned Block chains.

Unit III: **[5 periods]**

Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II: -Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool.

Unit IV: **[5 periods]**

Block chain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital Markets-Insurance- Block chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.

Unit V: [5 periods]

Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems: Block chain Cryptography: Privacy and Security on Block chain.

Text books:

1. Mark Gates, "*Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money*", Wise Fox Publishing and Mark Gates 2017.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "*Hands-On Block chain with Hyper ledger: Building decentralized applicationswith Hyperledger Fabric and Composer*", 2018.
3. Bahga, Vijay Madisetti, "*Block chain Applications: A Hands-On Approach*", Arshdeep Bahga,Vijay Madisetti publishers 2017.

Reference Books :

1. 1. Andreas Antonopoulos, "*Mastering Bitcoin: Unlocking Digital Crypto currencies*", O'ReillyMedia, Inc. 2014.
2. Melanie Swa, "*Block chain* ",O'Reilly Media 2014.

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

41T	Part I Tamil	3	6	1	0	Theory

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Course Outcome:

CO1	:	□□ பய□□ உ□□ள□□.	
CO2	:	□□ □□ள□□க□□ த□□த□□.	
CO3	:	□□ள□□.	
CO4	:	□□ள□□.	
CO5	:	□□.	

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1. நூல் மதிப்புரை - திறனாய்வு செய்தல் - 2.கடிதம் மற்றும் விண்ணப்பம் எழுதுதல் - கட்டுரை திறனை வளர்த்தல்- கட்டுரை தலைப்பு, கட்டுரை அமைப்பு முறைகள்

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Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
42E	**English for Communication-II**					

Introduction: To encourage students to inculcate and use effective communication skills in their day-to-day lives. To develop the LSRW skills to enhance the culture and thoughts through language and Literature

Course Outcome:

CO1	:	Learn to communicate effectively and appropriately in real-life situation
CO2	:	Use English effectively for study purposes across the curriculum
CO3	:	Develop interest in and appreciation of Literature
CO4	:	Develop and integrate the use of the four language skills
CO5	:	Enhance their language skills, especially in the areas of grammar and pronunciation

Unit I: **12 Hours**

1.1 I am Malala -Malala Yousafzai- Chapter1 - 1.2 Nelson Mandela's Interview with Larry King - 1.3 Job Applications: Cover Letters, CV/Resume - 1.4 Refuting, Discussion & Debating

Unit II: **12 Hours**

2.1 The Zoo Story- Edward Albee - 2.2 Rakesh Sharma's Interview with Indira Gandhi from Space - 2.3 Making Suggestions& Responding to Suggestions, Asking for and Giving Advice or Help – 2.4 Creating a digital profile-LinkedIn

Unit III: **12 Hours**

3.1 My Inventions-Nikola Tesla- Chapter 2 - 3.2 Lionel Messi with Sid Love-(Print) - 3.3 Body Language-Practical Skills for Interviews - 3.4 Interviews (face-to-face, telephone, and video conferencing)

Unit IV: **12 Hours**

4.1 The Proposal- Anton Chekhov - 4.2. Filling forms (Online & Manual) creation of account, railway reservation, ATM, Credit/ Debit card - 4.3. Speaking in a Formal situation (welcome address, Vote of the thanks

Unit V: **12 Hours**

5.1 Public Speaking - 5.2 Chicago Address-Swami Vivekananda - 5.3 SWOT Analysis

Text books:

1 Am Malala The Girl Who Stood Up for Education and Was Shot by the Taliban by Malala Yousafzai, Christina Lamb, Little Brown, 2013

2. My Inventions by Nikola Tesla, Ingram Short title, 2011 Edition

Reference Books :

1. Writing Your Life: A guide to writing Autobiographies, Mary Borg Taylor Francis, 2021.
2. One-act Plays for Acting Students: An Anthology of Short Norman A. Bert • 1987
3. The One-Act Play Companion: A Guide to plays, playwrights ... Colin Dolley, Rex Walford • 2015
4. How to Build a Professional Digital Profile Kindle Edition by Jeanne Kelly Bernish,Bernish Communications Associates, LLC; 1st edition (May)

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core Course – XI Theory Machine Learning	**4**				**Core Theory**

Introduction: This course introduces fundamental concepts and practical applications of machine learning (ML). Starting with essential Python libraries, it covers supervised and unsupervised learning, feature engineering, model evaluation, and advanced topics like text data processing and deployment.

Course Outcome:

CO1	:	Understand ML basics, data preprocessing, and model evaluation.
CO2	:	Apply supervised learning with algorithms like k-NN and decision trees.
CO3	:	Use unsupervised learning for clustering and dimensionality reduction.
CO4	:	Perform feature engineering and model evaluation with relevant metrics.
CO5	:	Use Python libraries (NumPy, SciPy, pandas, scikit-learn) for ML tasks and visualization.

Unit I: **12 Hours**

Introduction to Machine Learning and Python Basics: Why Machine Learning? - Problems Machine Learning Can Solve - Essential Python Libraries: NumPy, SciPy, matplotlib, pandas - Setting up the environment and installing scikit-learn - A First Application: Classifying Iris Species - Exploring the Iris dataset - Training and testing data - Building a k-Nearest Neighbors model - Evaluating the model

Unit 2: **12 Hours**

Supervised Learning: Classification and Regression - Generalization, Overfitting, and Underfitting - Supervised Machine Learning Algorithms: k-Nearest Neighbors - Linear Models - Decision Trees - Ensemble Methods (Random Forests, Gradient Boosting) - Neural Networks (Introduction) - Uncertainty Estimates from Classifiers - Evaluating Model Performance

Unit 3: **12 Hours**

Unsupervised Learning and Preprocessing: Types of Unsupervised Learning - Challenges in Unsupervised Learning - Preprocessing and Scaling Data - Dimensionality Reduction Techniques: - Principal Component Analysis (PCA) - Manifold Learning (t-SNE) - Clustering Algorithms: k-Means Clustering - Agglomerative Clustering – DBSCAN - Evaluating Clustering Algorithms

Unit 4: **12 Hours**

Feature Engineering and Model Evaluation: - Representing Data and Engineering Features: Categorical Variables - One-Hot-Encoding - Feature Scaling and Transformation - Feature Selection Techniques - Cross-Validation Techniques - Grid Search for Hyperparameter Tuning - Evaluation Metrics for Classification and Regression - Building Algorithm Chains and Pipelines

Unit 5: **12 Hours**

Advanced Topics and Application: Working with Text Data - Representing Text Data (Bag-of-Words, tf-idf) - Text Preprocessing Techniques (Tokenization, Stemming, Lemmatization) - Topic Modeling (Latent Dirichlet Allocation): - Wrapping Up and Practical Considerations: Approaching Machine Learning Problems - From Prototype to Production - Testing and Deploying ML Systems - Future Directions and Continuing Education in Machine Learning

Text books:

1. Müller, A. C., & Guido, S. (2016). Introduction to machine learning with Python: a guide for data scientists. " O'Reilly Media, Inc.".

Reference Books :

1. James, D. (2018). Introduction to Machine Learning with Python: A Guide for Beginners in Data Science. CreateSpace Independent Publishing Platform.
2. Lee, W. M. (2019). Python machine learning. John Wiley & Sons.

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	3	2	3	2	3	2	3	3	3	3	2	3
CO2	2	3	2	3	3	3	3	2	3	3	3	2
CO3	3	2	3	3	2	3	2	3	2	2	2	3
CO4	3	3	3	2	3	2	3	3	3	3	2	3
CO5	2	2	3	2	3	3	3	3	2	3	3	3

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

	Core Course – XII Theory / Practical Machine Learning Lab	**4**				**LAB**

Introduction:

Machine Learning Lab focuses on practical Python-based machine learning skills. Students learn setup, data exploration, and algorithm implementation.

Course Outcome:

CO1	:	Set up Python environments and install necessary libraries for machine learning.
CO2	:	Use pandas for data exploration and analysis.
CO3	:	Implement various machine learning algorithms and evaluate their performance
CO4	:	Assess model performance using metrics like accuracy, precision, recall, and silhouette score.
CO5	:	Apply advanced techniques such as PCA for dimensionality reduction and process text data for sentiment analysis.

List of Experiments:

1. Setting up Python environment with Anaconda and installing necessary libraries (NumPy, SciPy, matplotlib, pandas).
2. Explore the Iris dataset using pandas.
3. Implementing a k-Nearest Neighbors classifier for Iris species classification and evaluating its performance using metrics such as accuracy, precision, and recall.
4. Exploring overfitting and underfitting using a decision tree classifier on a synthetic dataset.
5. Training a linear regression model to predict housing prices and evaluating its performance.
6. Implementing a Random Forest classifier for a classification problem and comparing it with a single decision tree.
7. Introduction to neural networks using a simple feedforward network for digit recognition.
8. Applying PCA to reduce the dimensionality of the Iris dataset and visualizing the results.
9. Implementing k-means clustering on a dataset and evaluating clustering quality using metrics like silhouette score.
10. Processing text data for sentiment analysis using techniques like tokenization, stemming, and tf-idf representation.

Text books:

1. Müller, A. C., & Guido, S. (2016). Introduction to machine learning with Python: a guide for data scientists. " O'Reilly Media, Inc.".

Reference Books :

1. James, D. (2018). Introduction to Machine Learning with Python: A Guide for Beginners in Data Science. CreateSpace Independent Publishing Platform.
2. Lee, W. M. (2019). Python machine learning. John Wiley & Sons.

Course	**Program Outcomes**

Outcomes	P01	PO2	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
CO1	3	2	3	2	3	2	3	3	3	3	2	3
CO2	2	3	2	3	3	3	3	2	3	3	3	2
CO3	3	2	3	3	2	3	2	3	2	2	2	3
CO4	3	3	3	2	3	2	3	3	3	3	2	3
CO5	2	2	3	2	3	3	3	3	2	3	3	3

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Allied –Discrete Mathematics	**4**				**Core Theory**

Introduction: This paper enables the students to relate mathematics with Data Science and improve their logical thinking.

Course Outcome:

CO1	:	Students will gain an understanding of the Basic definition of Logics with examples.
CO2	:	Students will gain knowledge of Predicate Logic.
CO3	:	Students will be able to implement and evaluate types of Lattices and Boolean Algebra
CO4	:	Students will learn about Pigeon Hole principle and Permutation and Combination
CO5	:	Students will be able to gather information about Formal Languages.

Unit I: **12 Hours**

Propositional Logic: Definition, Statements & Notation, Truth Values, Connectives, Statement Formulas & Truth Tables, Well-formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Examples.

Unit 2: **12 Hours**

Predicate Logic: Definition of Predicates; Statement functions, Variables, Quantifiers, Predicate Formulas, Free & Bound Variables; The Universe of Discourse, Examples, Valid Formulas & Equivalences, Examples.

Unit 3: **12 Hours**

Lattices & Boolean Algebra: Properties of lattices – Lattice as Algebraic System-Sub lattices- lattice Homomorphism- Special Lattices – Boolean Algebra- sub algebra-Boolean Expression and Boolean functions- expression of a Boolean function in canonical formlogic Gates- Karnaugh Map Method

Unit 4: **12 Hours**

Basics of Counting: The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations, Generating Permutations and Combinations, Inclusion-Exclusion Principle.

Unit 5: **12 Hours**

Formal Language: Introduction- Phrase –Structure Grammar- Types – BNF- Finite state Machine – Input output stringsFinite state Automata **.**

Text Books:

1. Discrete mathematics – T. Veerarajan – McGraw Hill Education 2017

2. Ralph P. Grimaldi, "Discrete and Combinatoral Mathematics – An applied introduction", Third Edition, Addison Wesley Publishing Company, 1994.

Reference Books :

1. Discrete Mathematical Structures with application to Computer Science, Tremblay and Manohar – (Tata McGraw Hill, New Delhi) 1997.

2. Discrete mathematics, Venkataraman .M.K. and others –2000 The National Publishing Company.

Course Outcomes	Program Outcomes											
	P01	PO2	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
CO1	3		3					3	3		2	
CO2		3			2		3	2	3	3		2
CO3	3	2		3		1	3		2	3	3	3
CO4	3	3	2	3	3	3	2	1			3	
CO5			3	2		2				2		

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

	Web Mining	**4**				**Core Theory**

Introduction: This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

Course Outcome:

CO1	:	Understand ML basics, data preprocessing, and model evaluation.
CO2	:	Apply supervised learning with algorithms like k-NN and decision trees.
CO3	:	Use unsupervised learning for clustering and dimensionality reduction.
CO4	:	Perform feature engineering and model evaluation with relevant metrics.
CO5	:	Use Python libraries (NumPy, SciPy, pandas, scikit-learn) for ML tasks and visualization.

Unit I: **12 Hours**

Introduction: World Wide Web, History of the Web and the Internet, What is Data Mining? What is Web Mining? Introduction to Association Rule Mining, Supervised Learning & Unsupervised Learning. Information Retrieval and Web Search: Basic Concepts of Information Retrieval, Information Retrieval Models, Relevance Feedback, Evaluation Measures, Text and Web Page Pre-Processing, Inverted Index and Its Compression, Latent Semantic Indexing, Web Search, Meta-Search: Combining Multiple Rankings, Web Spamming.

Unit 2: Supervised Learning: **12 Hours**

Social Network Analysis: Introduction, Co-Citation and Bibliographic Coupling, Page Rank, HITS Algorithm, Community Discovery.

Web Crawling: A Basic Crawler Algorithm, Implementation Issues, Universal Crawlers, Focused Crawlers, Topical Crawlers, Evaluation, Crawler Ethics and Conflicts.

Unit 3: **12 Hours**

Structured Data Extraction: Wrapper Generation, Preliminaries, Wrapper Induction, Instance-Based Wrapper Learning, Automatic Wrapper Generation: Problems, String Matching and Tree Matching, Building DOM Trees, Extraction Based on a Single List Page, Extraction Based on Multiple Pages.

Unit 4: **12 Hours**

Information Integration: Introduction to Schema Matching, Pre-Processing for Schema Matching, Schema -Level Matching, Domain and Instance-Level Matching, Combining Similarities, 1: m Match, Integration of Web Query Interfaces, Constructing a Unified Global Query Interface. Opinion Mining and Sentiment Analysis: The Problem of Opinion Mining, Document Sentiment Classification, Sentence Subjectivity and Sentiment Classification, Opinion Lexicon Expansion, Aspect- Based Opinion Mining, Opinion Search and Retrieval, Opinion Spam Detection.

Unit 5: **12 Hours**
Web Usage Mining: Data Collection and Pre-Processing, Data Modeling for Web Usage Mining, Discovery and Analysis of Web Usage Patterns, Recommender Systems and Collaborative Filtering, Query Log Mining, Computational Advertising.
Text books: 1.Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010 2.Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008 References:
Reference Books : 1.Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010 2.Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

Course Outcomes	**Program Outcomes**											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	3	2	3	2	3	2	3	3	3	3	2	3
CO2	2	3	2	3	3	3	3	2	3	3	3	2
CO3	3	2	3	3	2	3	2	3	2	2	2	3
CO4	3	3	3	2	3	2	3	3	3	3	2	3
CO5	2	2	3	2	3	3	3	3	2	3	3	3

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Deep Learning	**4**				**Core Theory**

Introduction: To introduce students to the basic concepts and techniques of deep Learning.

Course Outcome:

CO1	:	Understand the basic concepts and techniques of Deep Learning.
CO2	:	To understand and apply the Machine learning principles
CO3	:	To study the deep learning architectures
CO4	:	Explore and create deep learning applications with tensor flow
CO5	:	Understand the basic concepts and techniques of Deep Learning.

Unit I: **12 Hours**

The Neural Network – Limits of Traditional Computing – Machine Learning – Neuron – FF Neural Networks – Types of Neurons – Softmax output layers

Unit 2: **12 Hours**

Tensor flow – Variables – Operations – Placeholders – Sessions – Sharing Variables – Graphs – Visualization

Unit 3: **12 Hours**

Convolution Neural Network – Feature Selection – Max Pooling – Filters and Feature Maps – Convolution Layer –Applications. .

Unit 4: **12 Hours**

Recurrent Neural Network – Memory cells – sequence analysis – word2vec- LSTM — Memory augmented Neural Networks – NTM—Application.

Unit 5: **12 Hours**

Reinforcement Learning – MDP – Q Learning – Applications

Text books:

Nikhil Buduma, Nicholas Locascio, ―Fundamentals of Deep Learning: Designing NextGeneration Machine Intelligence Algorithms‖, O'ReillyMedia, 2017.

Reference Books :

Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning (Adaptive computation and Machine Learning series, MITPress, 2017.

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	3	2	3	2	3	2	3	3	3	3	2	3
CO2	2	3	2	3	3	3	3	2	3	3	3	2
CO3	3	2	3	3	2	3	2	3	2	2	2	3
CO4	3	3	3	2	3	2	3	3	3	3	2	3
CO5	2	2	3	2	3	3	3	3	2	3	3	3

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Value Added Course: Software Engineering Principles	**2**	**3**	**-**	**-**	**Theory & Practical**

UNITI: Introduction to Software Engineering: [5 hours]

Overview of Software Engineering: Definition and importance of software engineering. Software Development Life Cycle (SDLC): Phases of SDLC, including planning, analysis, design, implementation, testing, deployment, and maintenance. Software Process Models: Waterfall, Agile, Spiral, V-Model, etc.

UNITII: Requirements Engineering: [5 hours]

Introduction to Requirements Engineering: Importance of requirement gathering. Requirements Elicitation Techniques: Interviews, questionnaires, observation, document analysis.

Functional vs. Non-functional Requirements: Definitions and differences. Requirements Specification and Documentation: Creating and maintaining requirements documents. Requirements Validation and Management: Ensuring accuracy and managing changes.

UNIT III: Software Design: **[5 hours]**

Introduction to Software Design: Design principles and concepts. Architectural Design: Software architecture and design patterns. UML Diagrams: Use case diagrams, class diagrams, sequence diagrams, activity diagrams. Design Patterns: Singleton, Factory, Observer, Strategy, and other design patterns. Design Best Practices: Modularity, cohesion, coupling, and encapsulation.

UNITIV: Software Implementation and Coding: [5 hours]

Coding Standards and Best Practices: Writing clean, maintainable code. Code Refactoring and Optimization: Improving code quality and performance. Source Code Version Control: Using Git and GitHub for version control. Introduction to Clean Code Principles: Writing code that is easy to understand and maintain. Collaborative Development: Techniques for effective team-based coding.

UNITV: Software Testing and Maintenance: **[5 hours]**

Types of Software Testing: Unit testing, integration testing, system testing, acceptance testing. Test-Driven Development (TDD): Writing tests before code to ensure functionality. Debugging Techniques: Identifying and fixing bugs. Maintenance and Evolution: Managing changes and updates to software over time. Software Quality Assurance: Ensuring software meets quality standards.

Text books:

1. Sommerville, Ian. Software Engineering (10th Edition). Pearson, 2015.
2. Pressman, Roger S. Software Engineering: A Practitioner's Approach (9th Edition). McGraw-Hill Education, 2019.

Reference Books :

1. Martin, Robert C. Clean Code: A Handbook of Agile Software Craftsmanship. Prentice Hall, 2008.

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core - I – ROBOTIC PROCESS AUTOMATION	**4**	**6**	**-**	**-**	**Core Theory**

Introduction:

This subject covers the Robotic Process Automation (RPA) represents a transformative approach to streamline and automate business processes. By employing software robots or "bots," RPA technology can mimic human actions to execute repetitive and mundane tasks, significantly enhancing operational efficiency, accuracy, and productivity.

Course Outcome:

CO1	:	Describe RPA, where it can be applied and how it's implemented
CO2	:	Describe the different types of variables, Control Flow and data manipulation techniques
CO3	:	Identify and understand Image, Text and Data Tables Automation
CO4	:	Describe how to handle the User Events and various types of Exceptions and strategies.
CO5	:	Understand the Deployment of the Robot and to maintain the connection.

UnitI: INTRODUCTION TO ROBOTIC PROCESS AUTOMATION

[12periods]

Scope and techniques of automation, Robotic process automation - What can RPA do?, Benefits of RPA, Components of RPA, RPA platforms, The future of automation. RPA BASICS: History of Automation - What is RPA - RPA vs Automation - Processes & Flowcharts - Programming Constructs in RPA - What Processes can be Automated - Types of Bots - Workloads which can be automated - RPA Advanced Concepts - Standardization of processes - RPA Development methodologies - Difference from SDLC - Robotic control flow architecture - RPA business case - RPA Team - Process Design Document/Solution Design Document - Industries best suited for RPA - Risks & Challenges with RPA - RPA and emerging ecosystem.

Unit II: RPA TOOL INTRODUCTION AND BASICS: [12 periods]

Introduction to RPA Tool - The User Interface - Variables - Managing Variables - Naming Best Practices - The Variables Panel - Generic Value Variables - Text Variables - True or False Variables - Number Variables - Array Variables - Date and Time Variables - Data Table Variables - Managing Arguments - Naming Best Practices - The Arguments Panel - Using Arguments - About Imported Namespaces - Importing New Namespaces- Control Flow - Control Flow Introduction - If Else Statements - Loops - Advanced Control Flow - Sequences - Flowcharts - About Control Flow - Control Flow Activities - The Assign Activity - The Delay Activity - The Do While Activity - The If Activity - The Switch Activity - The While Activity - The For Each Activity - The Break Activity - Data Manipulation - Data Manipulation Introduction - Scalar variables, collections and Tables - Text Manipulation - Data Manipulation - Gathering and Assembling Data

Unit III: ADVANCED AUTOMATION CONCEPTS & TECHNIQUES [12 periods]

Recording Introduction - Basic and Desktop Recording - Web Recording - Input/Output Methods - Screen Scraping - Data Scraping - Scraping advanced techniques - Selectors - Defining and Assessing Selectors - Customization - Debugging - Dynamic Selectors - Partial Selectors - RPA Challenge - Image, Text & Advanced Citrix Automation - Introduction to Image & Text Automation - Image based automation - Keyboard based automation - Information Retrieval - Advanced Citrix Automation challenges - Best Practices - Using tab for Images - Starting Apps - Excel Data Tables & PDF - Data Tables in RPA - Excel and Data Table basics - Data Manipulation in excel - Extracting

Unit IV: HANDLING USER EVENTS & ASSISTANT BOTS, EXCEPTION HANDLING [12 periods]

What are assistant bots? - Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger - Monitoring image and element triggers - An example of monitoring email - Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event. EXCEPTION HANDLING: Debugging and Exception Handling - Debugging Tools - Strategies for solving issues - Catching errors.

Unit V: DEPLOYING AND MAINTAINING THE BOT [12 periods]

Publishing using publish utility - Creation of Server - Using Server to control the bots - Creating a provision Robot from the Server - Connecting a Robot to Server - Deploy the Robot to Server - Publishing and managing updates - Managing packages - Uploading packages - Deleting packages

Text books:

1. Alok Mani Tripathi, “Learning Robotic Process Automation”, Packt Publishing, 2018.

Reference Books :

1. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive .Tasks & Become An RPA Consultant”, Independently Published, 1st Edition 2018.
2. Srikanth Merianda,”Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation”, Consulting Opportunity Holdings LLC, 1st Edition 2018.
3. Lim Mei Ying, “Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes”, Packt Publishing, 1st Edition 2018.

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	1	3	1	1	3	1	3	1	1	1	1	3
CO2	1	3	2	1	1	3	3	1	1	1	1	1
CO3	1	3	3	3	1	2	1	3	3	1	3	1
CO4	1	2	3	3	1	1	1	3	2	3	2	1
CO5	1	2	3	3	1	3	1	3	2	3	1	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core - I – Robotic Process Automation Lab	**4**	**6**	**-**	**-**	**Core Theory**

Introduction:

The Robotic Process Automation (RPA) Lab is designed to provide students with hands-on experience in automating various business processes using Automation Anywhere (AA) tools. The lab exercises cover a comprehensive range of activities, from software installation to bot creation and advanced automation techniques. By the end of this lab, students will have a solid understanding of RPA concepts and practical skills to design, develop, and deploy bots for automating tasks in real-world scenarios.

Course Outcome:

CO1	:	Understand the procedure for installing AA Control Room, SQL Server, and AA Client.
CO2	:	Develop bots using different recording methods such as Smart, Web, and Screen recorders.
CO3	:	Understand the use of various commands to enhance bot functionality and control flow.
CO4	:	Create bots to automate database operations and data handling.
CO5	:	Design and develop MetaBots incorporating AI capabilities.

1. Software Installation Procedure – Installation of AA Control Room, SQL
2. Server and AA Client.
3. Bot Creation using recorders (Smart, Web and Screen).
4. Bot Creation using command library – (Loop Command).
5. Bot Creation to invoke database automation
6. Bot Creation for automating excel operations
7. Bot Creation for PDF Integrations.
8. Bot Creation and working on error handling.
9. Bot Development using Object Cloning Command.
10. FTP and PGB Command Execution by Bots
11. MetaBot Designing with AI Sense

Text books:

1. Alok Mani Tripathi, “Learning Robotic Process Automation”, Packt Publishing, 2018.

Reference Books :

1. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive .Tasks & Become An RPA Consultant”, Independently Published, 1st Edition 2018.
2. Srikanth Merianda,”Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation”, Consulting Opportunity Holdings LLC, 1st Edition 2018.
3. Lim Mei Ying, “Robotic Process Automation with Blue Prism Quick Start Guide:

Create software robots and automate business processes", Packt Publishing, 1st Edition 2018.

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	1	3	1	1	3	1	3	1	1	1	1	3
CO2	1	3	2	1	1	3	3	1	1	1	1	1
CO3	1	3	3	3	1	2	1	3	3	1	3	1
CO4	1	2	3	3	1	1	1	3	2	3	2	1
CO5	1	2	3	3	1	3	1	3	2	3	1	1

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Data Mining with R	**4**	**6**	**0**	**0**	**Elective**

Introduction
'Data Mining with R', students will delve into the foundational principles and practical applications of data mining using the R programming language. The primary objective is to equip learners with the essential knowledge and skills required to extract valuable insights from large datasets. Throughout the course, participants will explore various data mining techniques such as clustering, classification, association rule mining, and anomaly detection. Special emphasis will be placed on hands-on experience with R packages like caret, arules, and cluster, enabling students to implement algorithms effectively and interpret their results. By the end of the course, students will not only understand the theoretical underpinnings of data mining but also gain proficiency in applying these techniques to real-world datasets, preparing them to make informed decisions and derive actionable insights in diverse domains."
Course Focuses: Skill Development/Entrepreneurship/Employability/**Research**

Course Outcome

CO1	:	Demonstrate accurate and efficient use of classification using the R system for the computations.
CO2	:	Demonstrate the related data mining techniques Using R
CO3	:	Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from the theory that underpins classification and related data mining methods
CO4	:	Apply problem-solving using classification and related data mining techniques to diverse situations in business, biology, engineering and other sciences
CO5	:	Analyze the data visualization.

UNIT I INTRODUCTION DATA MINING
Introduction, Mining Association Rules in Large Databases, Mining Frequent Patterns - basic concepts - Efficient and scalable frequent item set mining methods, Apriori algorithm, FP-Growth algorithm, Associations - mining various kinds of association rules.
UNIT II PREDICTIVE MODELING AND CLUSTERING
Classification and Prediction-Issues Classification by Decision Tree Induction– Bayesian Classification – Other Classification Methods – Prediction–Clusters Analysis – Basics of cluster analysis -Types of Data in Cluster Analysis – Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical Methods.
UNIT III MINING DATA STREAMS

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform (RTAP) Applications.
UNIT IV DATA ANALYTIC METHODS USING R
Introduction to R – Analyzing and exploring data with R - Statistics for model building and evaluation. Analytical Approaches, introducing to various Analytical Tools, Installing R, Handling Basic Expressions in R, Variables in R, Working with Vectors, Storing and Calculating Values in R, Creating and Using Objects, Interacting with Users, Handling Data in R Workspace
UNIT V FUNCTIONS AND PACKAGES IN R
Executing Scripts, Reading Datasets and Exporting Data from Manipulating and Processing Data in R, Working with Functions and Packages in R, Performing Graphical Analysis in R, Techniques Used for Visual Data Representation, Types of Data Visualization.
Text Books
1. Carlo Vercellis, Business Intelligence: Data mining and Optimization for Decision Making, WILEY. 2. Han J., Kamber M. and Pei J, Data mining concepts and techniques, Morgan Kaufmann Publishers (2011) 3rd ed.
Reference Books
1. Big Data Computing and Communications edited by Yu Wang, Hui Xiong, ShlomoArgamon, XiangYang Li, JianZhong Li Springer 2. Andrea Cirillo,"R Data Mining: Implement data mining techniques through practical use cases and real world datasets",Packt Publication,1st Edition,2017. 3. Luis Torgo."Data Mining with R" Learning with Case Studies, Second Edition 2020,Chapman and Hall/CRC.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes												
	P01	**P02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**PS01**	**PS02**	**PS03**	**PS04**
CO1	**3**	**3**	**3**	**1**	**3**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**3**
CO2	**3**	**2**	**3**	**1**	**3**	**1**	**2**	**1**	**3**	**3**	**2**	**2**	**2**
CO3	**3**	**3**	**3**	**1**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**1**	**3**
CO4	**3**	**2**	**3**	**1**	**3**	**1**	**2**	**1**	**3**	**3**	**2**	**3**	**2**
CO5	**3**	**3**	**3**	**1**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**2**	**3**

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective - III Network Security and Cryptgraphy	**4**	**6**	**-**	**-**	**Core Theory**

Introduction:

This subject covers the students will not only understand the theoretical underpinnings of data mining but also gain proficiency in applying these techniques to real-world datasets, preparing them to make informed decisions and derive actionable insights in diverse domains."

Course Outcome:

CO1	:	Demonstrate accurate and efficient use of classification using the network system for the computations.
CO2	:	To understand basics of Cryptography and Network Security
CO3	:	To be able to secure a message over insecure channel by various means
CO4	:	To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
CO5	:	To understand various protocols for network security to protect against the threats in the networks.

UNITI (Introduction to Cryptography and Block Ciphers)

Introduction to security attacks - services and mechanism - introduction to cryptography - Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – steganography - stream and blockciphers - Modern Block Ciphers: Block ciphers principals - Shannon's theory of confusion anddiffusion - fiestal structure - data encryption standard(DES) - strength of DES - differential and linearcrypt analysis of DES - block cipher modes of operations - triple DES – AES..

Unit II: (Confidentiality and Modular Arithmetic)

Confidentiality using conventional encryption - traffic confidentiality - key distribution - random number generation - Introduction to graph - ring and field - prime and relative prime numbers - modular arithmetic - Fermat's and Euler's theorem - primality testing - Euclid's Algorithm - Chinese Remainder theorem - discrete algorithms.

Unit III (Public key cryptography and Authentication requirements)

Principles of public key crypto systems - RSA algorithm - security of RSA - key management – Diffle-Hellman key exchange algorithm - introductory idea of Elliptic curve cryptography – Elgamel encryption - Message Authentication and Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks – security of hash functions and MACS.

Unit IV: (Integrity checks and Authentication algorithms)

MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication Applications: Kerberos and X.509 - directory

authentication service - electronic mail security-pretty good privacy (PGP) - S/MIME.
Unit V (IP Security and Key Management) IP Security: Architecture - Authentication header - Encapsulating security payloads - combining security associations - key management.
Text books: 1.William Stallings, "Crpyptography and Network security Principles and Practices", Pearson/PHI. 2. Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", Pearson.
Reference Books : 1.W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education. 2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.

Course Outcomes	**Program Outcomes**												
	P01	**P02**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**PS01**	**PS02**	**PS03**	**PS04**
CO 1	**3**	**2**	**3**	**2**	**3**	**1**	**2**	**1**	**3**	**3**	**2**	**3**	**1**
CO 2	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**2**	**3**
CO 3	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**1**	**2**	**1**	**1**
CO 4	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**3**	**3**
CO 5	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**1**	**3**	**2**

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Design and Analysis of Algorithm	**4**	**6**	**0**	**0**	**Elective**

Introduction
The Design and Analysis of Algorithms is a fundamental course in computer science and engineering that focuses on understanding the principles behind creating efficient and effective algorithms to solve computational problems. This course delves into the systematic approach to problem-solving using algorithms, covering both the design and analysis phases. In the design phase, students learn about various strategies and paradigms for creating algorithms, including divide and conquer, greedy methods, dynamic programming, backtracking, and more. The analysis phase involves evaluating the performance of these algorithms, primarily in terms of time and space complexity.
Course Focuses: Skill Development/Entrepreneurship/Employability/**Research**

Course Outcome

CO1	:	Get knowledge about algorithms and determines their time complexity. Demonstrate specific search and sort algorithms using divide and conquer technique.
CO2	:	Gain good understanding of Greedy method and its algorithm.
CO3	:	Able to describe about graphs using dynamic programming technique
CO4	:	Demonstrate the concept of backtracking & branch and bound technique
CO5	:	Explore the traversal and searching technique and apply it for trees and graphs.

UNIT-I INTRODUCTION
Introduction: - Algorithm Definition and Specification – Space complexity-Time Complexity Asymptotic Notations - Elementary Data Structure: Stacks and Queues – Binary Tree - Binary Search Tree - Heap – Heapsort- Graph.
UNIT –II TRAVERSAL AND SEARCH TECHNIQUES
Basic Traversal And Search Techniques: Techniques for Binary Trees-Techniques for Graphs - Divide and Conquer: - General Method – Binary Search – Merge Sort – Quick Sort.
UNIT –III GREEDY METHOD
The Greedy Method: - General Method – Knapsack Problem – Minimum Cost Spanning Tree – Single Source Shortest Path.
UNIT –IV DYNAMIC PROGRAMMING

Dynamic Programming - General Method – Multistage Graphs – All Pair Shortest Path – Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.
UNIT –V BACKTRACKING
Backtracking: - General Method – 8-Queens Problem – Sum Of Subsets – Graph Coloring – Hamiltonian Cycles – Branch And Bound: - The Method – Traveling Salesperson.
Text Books
1. Ellis Horowitz,"Computer Algorithms", Galgotia Publications. 2. Alfred V.Aho,John E.Hopcroft,Jeffrey D.Ullman, "Data Structures and Algorithms". **Reference Books**
1. Goodrich, "Data Structures & Algorithms in Java", Wiley 3rd edition. 2 Skiena,"The Algorithm Design Manual",SecondEdition,Springer , 2008. 3 AnanyLevith,"Introduction to the Design and Analysis of algorithm", Pearson Education Asia, 2003. 4 Robert Sedgewick,Phillipe Flajolet,"An Introduction to the Analysis of Algorithms", Addison-Wesley Publishing Company,1996.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes												
	P01	P02	P03	P04	P05	P06	P07	P08	P09	PS01	PS02	PS03	PS04
CO1	3	2	3	2	3	1	2	1	3	3	2	3	1
CO2	3	3	3	3	3	2	3	2	3	2	3	2	3
CO3	3	3	3	3	3	2	3	2	3	1	2	1	1
CO4	3	3	3	3	3	2	3	2	3	2	3	3	3
CO5	3	3	3	3	3	2	3	2	3	3	1	3	2

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Skill Enhancement Courses – III Practical / Training Embedded Systems and IoT	**4**	**6**	**-**	**-**	**Theory**

Introduction:

The internet of things paradigm promises to make things including consumer electronic devices or home appliances, such as medical devices, fridge, cameras, and sensors, part of the internet environment.

Course Outcome:

CO1	:	Students can understand and develop their knowledge of Internet of Things
CO2	:	Analyze basic protocols in wireless sensor network
CO3	:	Students can develop their knowledge of applications related with IOT.
CO4	:	Design IoT applications in different domain and be able to analyze their performance
CO5	:	Implement basic IoT applications on embedded platform.

Unit I: Introduction to IOT: Defining IoT - Characteristics of IoT - Physical design of IoT – Logical design of IoT - Functional blocks of IoT - Communication models & APIs - Machine to Machine - Difference between IoT and M2M - Software define Network.

Unit II: Networks & Communication aspects: Wireless medium access issues - MAC protocol survey - Survey routing protocols - Sensor deployment & Node discovery - Data aggregation & dissemination.

Unit III: Challenges in IOT: Design challenges - Development challenges - Security challenges - Other challenges.

Unit IV: Domain specific applications of IoT : Home automation - Industry applications - Surveillance applications - Other IoT applications

Unit V: Developing IoTs: Introduction to Python - Introduction to different IoT tools - Developing applications through IoT tools - Developing sensor based application through embedded system platform - Implementing IoT concepts with python

Text books:

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach” VPT Publication 2014
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor

Networks: Theory and Practice.

Reference Books :

1.Maciej Kranz ,Building the Internet of Things: Implement New Business Models,

Disrupt Competitors, Transform Wiley 2016.

Course Outcomes	Program Outcomes											
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**P10**	**P11**	**P12**
CO1	**3**	**3**		**2**		**2**			**2**		**3**	
CO2	**3**		**3**	**3**	**3**		**1**		**3**	**3**		**2**
CO3		**2**				**3**		**3**		**1**		
CO4	**3**		**1**	**3**		**2**	**3**	**3**	**3**		**3**	**3**
CO5		**3**			**3**			**2**		**3**		**3**

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Value Added Course: Fundamentals of Data Science and Machine Learning	**2**	**3**	**-**	**-**	**Theory & Practical**

UNITI: **[5 hours]**

Introduction to Data Science

Overview of Data Science - Data Science Life Cycle - Data Science Tools and Technologies - Data Collection and Data Cleaning - Exploratory Data Analysis

UNIT II: **[5 hours]**

Introduction to Machine

What is Machine Learning - Types of Machine Learning: Supervised, Unsupervised, and Reinforcement Learning - Key Terminologies in Machine Learning - Overview of Machine Learning Algorithms - Model Evaluation and Validation

UNIT III: **[5 hours]**

Supervised Learning:

Regression Analysis: Linear and Logistic Regression - Decision Trees and Random Forests - Support Vector Machines - Neural Networks and Deep Learning Basics - Model Evaluation Techniques: Cross-Validation, Confusion Matrix, ROC Curve

UNIT IV: **[5 hours]**

Unsupervised Learning

Clustering Techniques: K-means, Hierarchical Clustering - Dimensionality Reduction: PCA, LDA, t-SNE - Association Rule Learning: Apriori, Eclat - Anomaly Detection - Applications of Unsupervised Learning

UNIT V: **[5 hours]**

Practical Applications and Case Studies

Real-world Applications of Data Science and Machine Learning - Case Studies in

Healthcare, Finance, and Marketing - Ethics and Bias in Data Science and Machine Learning - Future Trends in Data Science and Machine Learning - Capstone Project: End-to-End Machine Learning Project
Text books: 3. "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett
Reference Books : 2. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron 3. "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython" by Wes McKinney

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	NATURAL LANGUAGE PROCESSING	**4**	**6**	**0**	**0**	**Theory**

Introduction:

To introduce the fundamental concepts and techniques of natural language processing (NLP)

Course Outcome:

CO1	:	Understand the fundamental concepts and techniques of natural language processing (NLP)
CO2	:	Understanding of the models and algorithms in the field of NLP
CO3	:	Demonstrate the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
CO4	:	Understanding semantics and pragmatics of languages for processing.
CO5	:	Understand the basic concepts and techniques of Pragmatic Level.

UnitI: [12periods]

Introduction: application of NLP techniques and key issues- MT grammar checkers- dictation – document generation- NL interfaces- Natural language processing key issues- the different analysis level used for NLP: morpho-lexical-syntactic-semantic-pragmatic-markup(TEI, UNICODE)-finite state automata- Recursive and augmented transition networks- open problems.

UnitII: [12periods]

Lexical level: error tolerant lexical processing(spelling error correction)-transducers for the design of morphologic analyzers features-towards syntax: part-of-speech tagging(BRILL,HMM)- efficient representations for linguistic resources(lexica, grammars,….) tries and finite state automata..

UnitIII: [12 periods]

Syntactic level: grammars(eg.formal/Chomsky hierarchy, DCSGs, systematic case, unification, stochastic)- parsing (top-down ,bottom up, char(early algorithm),CYK algorithm)- automated estimation of probabilistic model parameters(inside-outside algorithm)- data oriented parsing grammar formalisms and tree banks- efficient patsing for context-free grammars(CFGs)-statistical parsing and probabilistic CFGs(PCFGs)-lexicilizedPCFGse.

UnitIV: [12 periods]

Semantic level: logical forms- ambiguity resolution- semantic network and parsers-procedural semantics- montague semantics- vector space approaches- distributional semantics-lexical semantics and word sense disambiguation-compositional semantics semantic role labeling and semantic parsing.

UnitV: [12 periods]

Pragmatic level: knowledge representation- reasoning- plan/goal recognition –speech acts/intentions – belief models- discourse- reference. Natural language generation: content determination – sentence planning- surfacerealization,subjectivity and sentiment analysis: information extraction – automatic summarization- information retrieval and question answering – named entity recognition and relation extraction – IE using sequence labeling-machine translation: basic issues in MTstatisticaltranslation-word alignment- phrase-based translation and synchronous grammars.

Text books:

1. Daniel J and James H. Martin, speech and language processing an introduction to natural language processing, computational linguistcs& speech recognition prentice hall,2009.

Reference Books :

1. Lan H Written and Elbef, Mark A.Hall, data mining: practical machine learning tools and techiniques,Morgan Kaufmann,2013

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	1	2	2	2	1	2	2	1
CO2	1	1	2	1	3	3	1	3
CO3	2	2	2	2	1	2	3	2
CO4	1	1	1	3	3	2	2	3
CO5	1	2	2	1	2	3	3	3

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core-Natural Language Processing LAB					**Theory**

Introduction: This Natural Language Processing (NLP) Lab course provides hands-on experience in applying computational methods to analyze and process human language. Students will explore various techniques and tools to manipulate textual data, gaining practical insights into the field of NLP.

Course Outcome:

CO1	:	Master fundamental techniques in NLP like tokenization and frequency analysis using Python and NLTK.
CO2	:	Apply statistical methods and conditional frequency distributions to analyze text corpora efficiently.
CO3	:	Implement supervised machine learning models for tasks such as sentiment analysis and text classification.
CO4	:	Analyze sentence structure and extract grammatical relationships using syntactic parsing techniques.
CO5	:	Develop applications for named entity recognition (NER) and discourse analysis in textual data.

List of Experiments:

1. Write a program to tokenize a given text and compute word frequencies.
2. Implement a program to create and use conditional frequency distributions for text analysis.
3. Write a program to access and process text data from a corpus (e.g., Gutenberg, Brown corpus).
4. Develop regular expressions to identify and extract specific patterns (e.g., dates, emails) from text.
5. Create a program to handle and normalize text data encoded in Unicode.
6. Implement a POS tagging program using NLTK's built-in taggers (e.g., Unigram, Bigram).
7. Build a supervised machine learning model (e.g., Naive Bayes classifier) for sentiment analysis or topic classification of textual data.
8. Develop a program to parse sentences using syntactic parsing techniques (e.g., dependency parsing).
9. Implement a NER system to identify and classify named entities (e.g., persons, organizations) in text.

10. Write a program to extract specific types of information (e.g., relationships between entities) from text using chunking or dependency parsing.
11. Develop a program to analyze discourse structures or co-reference resolution in a given text.
12. Create scripts to manage linguistic data, such as downloading corpora, preprocessing text files, or building custom corpora.
13. Integrate NLP functionalities with external APIs (e.g., Google Natural Language API, Stanford NLP) for advanced analysis tasks.

Text books:

1. Bird, Steven, Ewan Klein, and Edward Loper. Natural language processing with Python: analyzing text with the natural language toolkit. "O'Reilly Media, Inc.", 2011.
2. Thanaki, Jalaj. Python natural language processing. Packt Publishing Ltd, 2017.

Reference Book:

1. Sarkar, Dipanjan. Text analytics with Python: a practitioner's guide to natural language processing. Bangalore: Apress, 2019.

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	1	2	2	2	1	2	2	1
CO2	1	1	2	1	3	3	1	3
CO3	2	2	2	2	1	2	3	2
CO4	1	1	1	3	3	2	2	3
CO5	1	2	2	1	2	3	3	3

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective – IV Fuzzy Logic and Neural Networks	**4**	**6**	**-**	**-**	**Elective Theory**

Introduction:

- To introduce the concepts of artificial neural networks and fuzzy systems
- To explain the basic mathematical elements of the theory of fuzzy sets

Course Outcome:

CO1	:	Explain the concepts of neural networks and, fuzzy logic
CO2	:	Understanding of the basic mathematical elements of the theory of fuzzy sets.
CO3	:	Understanding the differences and similarities between fuzzy sets and classical sets theories
CO4	:	Solve problems that are appropriately solved by neural networks and fuzzy logic.

Unit I: Introduction [12 periods]

Basic concepts-single layer perceptron-Multi layer perceptron-Adaline-Madaline-Learning rulesSupervised learning-Back propagation networks-Training algorithm, Advanced algorithms - Adaptive network- Radial basis network modular network-Applications.

UnitII:Learning [12periods]

Introduction- unsupervised learning -Competitive learning networks-Kohonen self-organising networks-Learning vector quantisation - Hebbian learning – Hopfield network-Content addressable nature, Binary Hopfield network, Continuous Hopfield network Travelling Salesperson problem - Adaptive resonance theory –Bidirectional Associative Memory-Principle component Analysis.

UnitIII:FuzzySets [12periods]

Introduction – crisp sets an overview – the notion of fuzzy sets – Basic concepts of fuzzy sets – classical logic an overview – Fuzzy logic. Operations on fuzzy sets - fuzzy complement – fuzzy union – fuzzy intersection – combinations of operations – general aggregation operations..

UnitIV:Relations [12periods]

Crisp and fuzzy relations – binary relations – binary relations on a single set– equivalence and similarity relations – Compatibility or tolerance relations– orderings – Membership functions – methods of generation – defuzzification methods.

UnitVTreeLearning [12periods]

Adaptive Neuro Fuzzy based inference systems – classification and regression trees: decision tress, Cart algorithm – Data clustering algorithms: K means clustering, Fuzzy C means clustering, Mountain clustering, Subtractive clustering – rule base structure identification – Neuro fuzzy control: Feedback Control Systems, Expert Control, Inverse Learning, Specialized Learning, Back propagation through Real –Time Recurrent Learning

Text books:

1. Neuro Fuzzy and Soft computing, Jang J.S.R.,Sun C.T and Mizutani E – Pearson education, 2004 2. Bradshaw, ―Software Agents‖, MIT Press, 2012.
2.Fundamentals of Neural Networks, LaureneFauseett, Prentice Hall India, New Delhi,1994.

Reference Books:

1. Fuzzy Logic Engineering Applications, Timothy J.Ross, McGrawHill,NewYork,1997.
2. Neural networks,Fuzzy logics,and Genetic algorithms, S.Rajasekaran and G.A.VijayalakshmiPai Prentice Hall of India,2003.
3. Fuzzy Sets and Fuzzy Logic, George J.Klir and Bo Yuan, Prentice Hall Inc., New Jersey,1995.
4. Principles of Soft Computing S.N.Sivanandam, S.N.Deepa Wiley India Pvt Ltd.

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	1	2	2	2	1	2	2	1
CO2	1	1	2	1	3	3	1	3
CO3	2	2	2	2	1	2	3	2
CO4	1	1	1	3	3	2	2	3
CO5	1	2	2	1	2	3	3	3

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective – IV Digital Image Processing	**4**	**6**	**-**	**-**	**Elective Theory**

Introduction:

To enable the students to learn the introduction to digital image processing, fundamentals, image enhancement and image restoration techniques.

Course Outcome:

CO1	:	Understand the fundamentals of digital image processing and sampling and quantization concepts.
CO2	:	Apply image processing techniques in both the spatial and frequency domains using various transform techniques.
CO3	:	Understanding the filtering techniques for Image restoration and reconstruction.
CO4	:	Understanding fundamentals and some basic models of Image Compression.
CO5	:	Applying the image segmentation process.

UnitI: [12periods]

Introduction: What is digital image processing – The origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital image fundamentals: Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and quantization – Some basic relationship between pixels – Linear & Nonlinear operations.

UnitII: [12periods]

Intensity Transformations and Spatial Filtering: - Background – Some basic intensity transformation functions– Histogram processing – Fundamentals of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.

UnitIII: [12periods]

Image restoration and reconstruction: A model of the image degradation /restoration process – Noise models – Restoration is the presence of noise only - Spatial filtering - Periodic Noise Reduction by Frequency Domain Filtering - Estimating the degradation function – Inverse filtering – Minimum mean square error filtering – Constrained least squares filtering – Geometric mean filter.

UnitIV: [12periods]

Image compression: fundamentals – image compression models – Image Formats, Containers and Compression Standards. Some Basic Compression Methods – Digital Image Watermarking.

UnitV: **[12periods]** Image segmentation: Fundamentals – Points, Lines and Edge Detection – Threshold – Region-based segmentation
Text books: 1. Rafael C.Gonazalez, Richard E. Woods, "Digital Image Processing", Pearson Education, Third Edition.
Reference Books: 1. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003. 2. William K.Pratt, "Digital Image Processing", 3 rd edition, Wiley India Pvt. Ltd, 2013

Course Outcomes	**Program Outcomes**							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	1	2	2	2	1	2	2	1
CO2	1	1	2	1	3	3	1	3
CO3	2	2	2	2	1	2	3	2
CO4	1	1	1	3	3	2	2	3
CO5	1	2	2	1	2	3	3	3

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective – IV Human-Computer Interaction	**4**	**6**	**-**	**-**	**Elective Theory**

Introduction:
Human-Computer Interaction plays a crucial role in shaping the design and development of technologies that enhance human capabilities, improve productivity, and enrich everyday experiences.

Course Outcome:

CO1	:	To explore the historical evolution of the Human-Computer Interaction.
CO2	:	understanding of modelling techniques
CO1	:	Understanding of Design Principles and Application of Design Models
CO4	:	Understanding of Motivation and Issues in Research
CO5	:	To designing effective and user-friendly interactive systems across various domains.

UnitI: [12periods]

Historical evolution of the field - Interactive system design - Concept of usability - definition and elaboration - HCI and software Engineering, GUI design and Aesthetics - Prototyping techniques

Unit II:
[12periods]
Model-based Design and evaluation
Basic idea - introduction to different types of models - GOMS family of models (KLM and CMN- GOMS), Fitts' law and Hick-Hyman's law, Model-based design case studies.

UnitIII: [12periods]
zuidelinesinHCI
Schneiderman's eight - golden rules - Norman's seven principles - Norman's model of interaction, Nielsen's ten heuristics with examples of its use Heuristic evaluation - Contextual inquiry - Cognitive walkthrough

Unit
IV:[12periods]

Empirical research methods in HCI

Introduction (motivation, issues, research question formulation techniques) -

Experiment design and data analysis
Unit V: **Task modelling and analysis** **[12 periods]** Hierarchical task analysis (HTA), Concur Task Tree (CTT), Introduction to formalism in dialog design, design using FSM (finite state machines) Statecharts and (classical) Petri Nets in dialog design.
Text books: 1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human-Computer Interaction, 1rd Edition, Pearson Education, 2004Brian Fling, ―Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009)
Reference Books: 1. Bill Scott and Theresa Neil, ―Designing Web Interfaces, First Edition, O'Reilly,

Course Outcomes	**Program Outcomes**												
	P01	**P02**	**P01**	**P04**	**P05**	**P06**	**P07**	**P08**	**P09**	**PS01**	**PS02**	**PS01**	**PS04**
CO1	**1**	**1**	**1**		**2**		**1**		**2**		**1**	**1**	
CO2				**1**				**1**		**1**			**1**
CO1	**1**	**2**	**2**	**1**	**1**	**1**	**2**	**1**	**1**	**1**		**2**	
CO4	**1**	**1**	**1**			**1**			**1**		**1**	**1**	
CO5	**1**			**1**		**2**			**1**	**2**			**1**

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Skill Enhancement Courses – IV Practical / Training Web Technology	**4**	**6**	**-**	**-**	**Elective Theory**

Introduction:
Understanding of Web Development Fundamentals

Course Outcome:

CO1	:	Students will be able to demonstrate a solid understanding of HTML, CSS, and JavaScript to create and style web pages.
CO2	:	Students will be able to write and implement JavaScript code for dynamic content manipulation, event handling, and form validation.
CO1	:	Students will be able to create responsive web designs using CSS media queries and frameworks.
CO4	:	Students will be able to implement AJAX techniques for asynchronous data retrieval and manipulation.
CO5	:	Students will be able to develop single-page applications using modern JavaScript frameworks/libraries like React or Angular.

List of Experiments:

1.**Basic HTML Page**: Create a simple HTML page with headings, paragraphs, links, and lists.

2.**CSS Styling**: Design a web page with CSS to style text, layout, and backgrounds.

3.**JavaScript Basics**: Write a JavaScript program to manipulate HTML elements, such as changing text and styles dynamically.

4.**Form Handling**: Create a web form with HTML and JavaScript for user input validation and submission.

5.**Responsive Design**: Develop a responsive web page using CSS media queries to adjust the layout for different screen sizes.

6.**DOM Manipulation**: Implement a JavaScript program to add, remove, and modify HTML elements and attributes dynamically.

7.**AJAX Request**: Create a web application that makes asynchronous HTTP requests using AJAX to fetch and display data from a server.

8.**jQuery Basics**: Write a jQuery program to handle events and animate HTML

elements. 9.**Bootstrap Integration**: Design a responsive and aesthetically pleasing web page using Bootstrap framework components. 10.**Single Page Application (SPA)**: Develop a simple single-page application using a JavaScript framework/library like React or Angular to manage routing and dynamic content.
Text books: 1. "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics" by Jennifer Niederst Robbins
Reference Books: 1. Fullstack React: The Complete Guide to ReactJS and Friends" by Anthony Accomazzo, Nathaniel Murray, and Ari Lerner

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Value Added Course - Problem Solving and Algorithm Development	**2**	**3**	**-**	**-**	**Theory & Practical**

UNIT I: **5 Hours**

Problem Solving and Algorithmic Thinking

Problem Solving and Algorithmic Thinking Overview – problem definition, logical reasoning; Algorithm – definition, practical examples, properties, representation, algorithms vs programs.

UNIT II: **5 Hours**

Problem Understanding and Analysis

Algorithmic thinking – Constituents of algorithms – Sequence, Selection and Repetition, input-output; Computation – expressions, logic; Problem Understanding and Analysis – problem definition, input-output, variables

UNIT III: **5Hours**

Introduction to Problem Solving programs

Introduction to Problem Solving through programs, Steps to develop a program, Representation of Algorithm, Software development life cycle, Programming approaches, Types of programming languages, Introduction to c, Developing a c program, Console input and output functions, Syntax and Semantic errors.

UNIT IV: **5Hours**

Operators and Expressions

Identifiers and keywords, Data types, Constants, Variables, Declarations, Expressions, Statements, Arithmetic operators, Unary operators, Relational and logical operators, Assignment operators, Conditional operator.

UNIT V: **5Hours**

Algorithm Implementation

Branching, Looping, Arrays, Function implementation algorithm for these concepts.

Text books:

1. Riley DD, Hunt KA. Computational Thinking for the Modern Problem Solver. CRC press; 2014 Mar 27
2. Byron Gottfried, “Schaum's Outline of Programming with C”,McGraw Hill Education (India), 4th edition, 2018, ISBN: 978-9353160272

Reference Books :

1. Yashavant Kanetkar, “Let Us C”, Bpb Publications, 15th edition, 2016, ISBN:9788183331630