DEPARTMENT OF COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Nallamuthu Gounder Mahalingam College
(Autonomous)
(An ISO 9001:2015 Certified Institution)
Re-Accredited with 'B' Grade by NAAC
Pollachi-642001

SYLLABUS

B.Sc. COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

BATCH 2022-2025

NGM COLLEGE

Vision

Our dream is to make the College an institution of excellence at the national level by imparting quality education of global standards to make students academically superior, socially committed, ethically strong, spiritually evolved and culturally rich citizens to contribute to the holistic development of the self and society.

Mission

Training students to become role models in academic arena by strengthening infrastructure, upgrading curriculum, developing faculty, augmenting extension services and imparting quality education through an enlightened management and committed faculty who ensure knowledge transfer, instill research aptitude and infuse ethical and cultural values to transform students into disciplined citizens in order to improve quality of life.

DEPARTMENT OF COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Vision

To be a leading school of emerging trends in Artificial Intelligence and Machine Learning that affords quality education to equip students with the technical know-how, ascertain their hidden talents, provide ambient environment to show case their highest potential and to transform the students to be creative and innovative leaders and entrepreneurs as anticipated by the Industry

Mission

- To offer a broad and balanced academic plans that strengthens and emphasizes high quality and creative instruction
- To strive for quality education that will prepare young minds for imbibing knowledge, skills and sensitivity.
- To create a platform for students for exploring their creative potential and nurturing the spirit of entrepreneurship and critical thinking.
- To inculcate a strong belief in hard work and equip students with the skills needed to adapt better to the changing global scenario and gain access to multiple career opportunities.

- To generate new domain knowledge through a broad array of scholarly, research and creative endeavors, which provide the basis to uncover the immediate and long-term needs of the Industry.
- To offer opportunities and encourage the students to Initiate, sustain and nourish research groups in Artificial Intelligence.
- To motivate the budding professionals in exploiting the potential of start-ups and innovations in Artificial Intelligence & Machine Learning and the related Domains.
- To maintain level of excellence and standards that offers them statewide, national and international significance.

Program Educational Objectives (PEOs)	
The B.Sc. Computer Science with Artificial Intelligence & Machine Learning program describe accomplishments that graduates are expected to attain within five to seven years after graduation.	
PEO1	Expertise with the principles of Artificial Intelligence and problem solving, inference, perception, knowledge representation, and learning
PEO2	Exhibit high standards with regard to application of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning and deep learning models
PEO3	Investigate with a machine learning model for simulation and analysis and explore the scope, potential, limitations, and implications of intelligent systems.
PEO4	Establish the ability to Listen, read, proficiently communicate and articulate complex ideas with respect to the needs and abilities of diverse audiences.
PEO5	Instillkey technologies in Artificial Intelligence, Machine Learning and deep learning, visualization techniques, Natural language processing and Robotics.

Programme Outcomes (POs)	
On successful completion of the B.Sc. Computer Science with Artificial Intelligence & Machine Learning	
PO1	**Domain Knowledge:** Demonstrate a sound understanding of all the main areas of Machine Learning & AI and also demonstrate the ability to exercise critical judgement in the evaluation of Machine Learning and AI applications.
PO2	**Problem Analysis:** Understand how to distill a real-world challenge as an artificial intelligence problem, involving explicit representation and learning of symbolic and numeric models; reasoning about such models; and using such models for decision making, action selection, and interaction with humans.
PO3	**Design/development of solutions:**Design and develop research-based solutions for complex problems in artificial intelligence and machine learning industry through appropriate consideration for the public health, safety, cultural, societal, and environmental concerns.
PO4	**Communicative & oratorical Skills:**Establish the ability to Listen, read, proficiently communicate and articulate complex ideas with respect to the needs and abilities of diverse audiences.

PO5	**Exhibit Entrepreneurial Skills:** Deliver innovative ideas to instigate new business ventures and possess the qualities of a good entrepreneur
PO6	**Ethics:**Recognize the social impact of artificial intelligence and the underlying responsibility to consider the ethical, privacy, moral, and legal implications of artificial intelligence technologies**.**
PO7	**Individual and teamwork:**Graduates will be able to undertake any responsibility as an individual/member of multidisciplinary teams and have an understanding of team leadership
PO8	**Use of State-of-the-Art AI and machine learning tools & techniques:** Design, analyze, implement, and use state-of-the-art AI and machine learning tools & techniques for dealing with real-world data, including data involving vision, language, perception, and uncertainty.
PO9	**Dynamism and Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PO10	**Research instinct**: Apply AI and ML specific research techniques, tools,methods, design of experiments, analysis and synthesis of the information for conducting investigations of complex problems.

Program Specific Outcomes (PSOs)	
After the successful completion of **B.Sc. Computer Science with Artificial Intelligence and Machine Learning**program, the students are expected to	
PSO1	Exhibit good domain knowledge and completes the assigned responsibilities effectively and efficiently in par with the expected quality standards for Artificial Intelligence and Machine Learning professional.
PSO2	Apply the technical and critical thinking skills in the discipline of artificial intelligence and machine learning to find solutions for complex problems.Design and develop research-based solutions for complex problems in artificial intelligence and machine learning industry through appropriate consideration for the public health, safety, cultural, societal, and environmental concerns.

PEOs / POs \ PSOs	PEO1	PEO2	PEO3	PEO4	PEO5
PO1	H	H	H	L	L
PO2	H	H	H	L	L
PO3	H	H	H	H	L
PO4	L	M	M	M	L
PO5	M	M	M	H	M
PO6	L	L	M	H	L
PO7	M	M	M	H	M
PO8	L	L	L	H	M
PO9	M	M	M	H	L
PO10	M	M	M	M	L
PSO1	H	H	H	M	L
PSO2	H	H	H	H	M

B.Sc. – COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE & MACHINE LEARNING SCHEME OF EXAMINATION FOR 2022 - 2023 CHOICE BASED CREDIT SYSTEM & OBES									
Part	**Course Code**	**Title of the Paper**	**Hours/ Week**		**Exam Hours**	**MAX.MARKS**			**Credits**
			T	**P**		**CIA**	**ESE**	**Total**	
I SEMESTER									
I	22UTL101/ 22UHN101/ 22UFR101	Tamil Paper-I/ Hindi Paper-I/ French Paper-I	6		3	50	50	100	3
II	22UEN101	English Paper-I	5		3	50	50	100	3
III	22UDA101	Core I: Java Programming	4		3	50	50	100	4
	22UAI102	Core II: Industry 4.0	4		3	50	50	100	4
	22UAI1A1	General Elective-1: Introduction to Linear Algebra	4		3	50	50	100	4
	22UAI103	Core Lab I: Programming Lab in Java		5	3	25	25	50	2
IV	22HEC101	Human Excellence: Personal Values& SKY Yoga Practice – 1		1	2	25	25	50	1
	22UHR101	Human Rights in India	1		2		50	50	2
V		Extension Activities (NSS, NCC, Sports & Games)							
Total								**650**	**23**

II SEMESTER									
Part	**Course Code**	**Title of the Paper**	**Hours/ Week**		**Exam Hours**	**MAX.MARKS**			**Credits**
			T	P		**CIA**	**ESE**	**Total**	
I	22UTL202/ 22UHN202 22UFR202	Tamil Paper-II/ Hindi Paper-II/ French Paper-II	6		3	50	50	100	3
II	22UEN202	English Paper – II	5		3	50	50	100	3
III	22UAI204	Core III: Programming in Python	3		3	50	50	100	4
	22UAI205	Core IV: Data Structures & Algorithms	4		3	50	50	100	4
	22UAI2A1	General Elective 2 : Optimization techniques	5		3	50	50	100	4
	22UAI206	Core Lab II: Programming Lab in Python		4	3	25	25	50	2
	22UAI207	Capstone Project - 1				25	25	50	2
IV	22HEC202	Human Excellence: Family Values& SKY Yoga Practice-2		1	2	25	25	50	1
	22EVS201	Environmental Studies	2		2		50	50	2
V		Extension Activities (NSS, NCC, Sports & Games)							
EC		Online Course (MOOC/NPTEL/SWAYAM) Optional							
	22CMM201	Manaiyiyal Mahathuvam - I	Certificate course						
	22CUB201	Uzhavu Bharatham - I	Certificate course						
Value Added Course	22VAD201	Department Specific Value-Added Course							
Total								**700**	**25**

Part	Course Code	Title of the Paper	Hrs/ Week		Exam Hrs	MAX.MARKS			Credits
			T	P		CIA	ESE	Total	
III SEMESTER									
I	22UTL303/ 22UHN303/ 22UFR303	Tamil Paper-III/ Hindi Paper-III/ French Paper-III	3		3	50	50	100	3
II	22UEN303	English Paper – III	3		3	50	50	100	3
III	22UAI308	**Core V:** Database System Concepts	5		3	50	50	100	3
	22UAI309	**Core VI**: Introduction to AI	5		3	50	50	100	3
	22UAI3A1/ 22UAI3A2	**General Elective 3** : Discrete structures and its Application/Numerical techniques	4		3	50	50	100	3
	22UAI310	**Core Lab III:** Database System Concepts Lab		4	3	25	25	50	2
	22UAI311	**Core Lab IV**: AI Lab		4	3	25	25	50	2
IV	22HEC303	Human Excellence Paper: Professional Values& SKY Yoga Practice-3		1	2	20	30	50	1
	22UAI3N1 / 22UAI3N2	**Non-Major Elective Paper I**: Internet Concepts / Data Processing Through Excel Lab		1	2	-	50	50	2
V		Extension Activities (NSS, NCC, Sports & Games, etc.,)	-	-	-	-	-	-	-
	22CMM302	Manaiyiyal Mahathuvam-II	15 hrs certificate course						
	22CUB302	Uzhavu Bharatham – II	15 hrs certificate course						
Total			**30**					**700**	**22**

Part	Course Code	Title of the Paper	Hrs/ Week		Exam hrs	MAX.MARKS			Credits
			T	P		CIA	ESE	Total	
IVSEMESTER									
I	22UTL404/ 22UHN404/ 22UFR404	Tamil Paper-IV/ Hindi Paper-IV/ French Paper-IV	3		3	50	50	100	3
II	22UEN403	English Paper – IV	3		3	50	50	100	3
III	22UAI412	**Core VII**: Cloud Computing	4		3	50	50	100	3
	22UAI413	**Core VIII**: Introduction to Machine Learning	4		3	50	50	100	3
	22UAI4A4	**General Elective 4**: Mathematics for ML	4		3	50	50	100	3
	22UAI414	**Core Lab V**: ML Lab		5	3	20	30	50	2
	22UAI415	Capstone Project – 2		1		20	30	50	2
	22UAI416	**SEC II**: Naan Mudhalvan / Block Chain		2	2	20	30	50	2
IV	22HEC404	Human Excellence Paper : Social Values & SKY Yoga Practice-4		1	2	20	30	50	1
	22UAI4N1	**Non-Major Elective Paper-II**: Web Technology lab /WEB APPLICATION using Photoshop		1	2	-	50	50	2
V		Extension Activities (NSS, NCC, Sports &Games,etc.,)						50	1
	22CMM403	Manaiyiyal Mahathuvam-III	1	-	2	-	50	50	Grade
	22CUB403	Uzhavu Bharatham – III	1	-	2	-	50	50	Grade
	22UAIVA	**VAC II**: Python for Data Science							2*
		Total	**30**					**800**	**25**

Question Paper Pattern
(Based on Bloom's Taxonomy)

K1-Remember; **K2**- Understanding; **K3**- Apply; **K4**-Analyze; **K5**- Evaluate

1. Theory Examinations: 50 Marks (Part I, II, & III)

(i) Test- I & II, ESE:

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q 1 -10)	A (Q 1 – 5 MCQ) (Q 6–10 Define/Short Answer)	10 x 1 = 10	MCQ/Define	**50**
K3 (Q 11-15)	B (Either or pattern)	5 x 3 = 15	Short Answers	
K4 & K5 (Q 16 – 20)	C (Either or pattern)	5 x 5 = 25	Descriptive/ Detailed	

2. Theory Examinations: 50 Marks (Part IV :NME)

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q 1 -10)	A (Q 1 – 5 MCQ) (Q 6–10 Define/Short Answer)	10 x 1 = 10	MCQ Define	**50**
K3, K4 & K5 (Q 11-15)	B (Either or pattern)	5 x 8 = 40	Short Answers	

3. Practical Examinations: 100/50 Marks

Knowledge Level	Criterion	External/Internal Marks	Total
K3	Record work & Practical	50/50	100
K4			
K5		25/25	50

Components of Continuous Assessment

THEORY

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Test 1	(50 / 3.33) = 15	15+15+10+05+05	50
Test 2 / Model	(50 / 3.33) = 15		
Assignment / Digital Assignment	10		
Seminar / Socratic Seminar	05		
Group Task : GD, Role Play, APS	05		

Maximum Marks: 50; CIA Mark: 25

Components		Calculation	CIA Total
Test / Model	10	10+5+5+5	25
Assignment / Digital Assignment	5		
Seminar / Socratic Seminar	5		
Group Task : GD, Role Play, APS	5		

PRACTICAL

Maximum Marks: 50; CIA Mark: 25

Components		Calculation	CIA Total
Test / Model	15	15+5+5	25
Observation Note	5		
Record	5		

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Test / Model	30	30+5+15	50
Observation Note	5		
Record	15		

Maximum Marks: 200; CIA Mark: 100

Components		Calculation	CIA Total
Test / Model	60	60+10+30	100
Observation Note	10		
Record	30		

PROJECT

Maximum Marks: 100; CIA Mark: 50

Components		Calculation	CIA Total
Review I	10	10+10+10+20	50
Review II	10		
Review III	10		
Report Submission	20		

Maximum Marks: 200; CIA Mark: 100

Components		Calculation	CIA Total
Review I	20	20+20+20+40	100
Review II	20		
Review III	20		
Report Submission	40		

** Components for 'Review' may include the following:*

Originality of Idea, Relevance to Current Trend, Candidate Involvement and Presentation of Report for Commerce, Management & Social Work.
Synopsis, System Planning, Design, Coding, Input form, Output format, Preparation of Report & Submission for Computer Science cluster.

STUDENT SEMINAR EVALUATION RUBRIC

Grading Scale:

A	B	C	D
5	**4**	**2 - 3**	**0 - 1**

CRITERIA	A – Excellent	B - Good	C - Average	D - Inadequate
Organization of presentation	Information presented as interesting story in logical, easy to follow sequence	Information presented in logical sequence; easy to follow	Most of information presented in sequence	Hard to follow; sequence of information jumpy

Knowledge of subject & References	Demonstrated full knowledge; answered all questions with elaboration **&** Material sufficient for clear understanding **AND** exceptionally presented	At ease; answered all questions **but** failed to elaborate **&** Material sufficient for clear understanding **AND** effectively presented	At ease with information; answered most questions **&** Material sufficient for clear understanding **but** not clearly presented	Does not have grasp of information; answered only rudimentary Questions **&** Material not clearly related to topic **OR** background dominated seminar
Presentation Skills using ICT Tools	Uses graphics that explainand reinforce text and presentation	Uses graphics thatexplain text and presentation	Uses graphics that relate to text and presentation	Uses graphics that rarelysupport text and presentation
Eye Contact	Refers to slides to makepoints; engaged with audience	Refers to slides to makepoints; eye contact majority of time	Refers to slides to makepoints; occasional eye contact	Reads most slides; no or just occasional eye contact
Elocution – (Ability to speak English language)	Correct, precise pronunciation of all terms. Voice is clear andsteady; audience can hear well at all times	Incorrectly pronounces few terms. Voice is clear with few fluctuations; audience can hear well most of the time	Incorrectly pronounces some terms. Voice fluctuates from low to clear; difficult to hear at times	Mumbles and/or Incorrectly pronounces some terms. Voice is low; difficult to hear

WRITTEN ASSIGNMENT RUBRIC

Grading Scale:

A	B	C	D	F
09 - 10	07- 08	05 - 06	03 - 04	01 - 02

CRITERION	A - Excellent	B - Good	C - Average	D – Below Average	F - Inadequate
Content & Focus	Hits on almost all content exceptionally clear	Hits on most key points and writing is interesting	Hits in basic content and writing is understandable	Hits on a portion of content and/or digressions and errors	Completely off track or did not submit
Sentence Structure & Style	* Word choice is rich and varies * Writing style is consistently strong * Students own formal language	* Word choice is clear and reasonably precise * Writing language is appropriate to topic * Words convey intended message	* Word choice is basic * Most writing language is appropriate to topic * Informal language	* Word choice is vague * Writing language is not appropriate to topic * Message is unclear	* Not adequate
Sources	Sources are cited and are used critically	Sources are cited and some are used critically	Some sources are missing	Sources are not cited	Sources are not at all cited

Neatness	Typed; Clean; Neatly bound in a report cover; illustrations provided	Legible writing, well-formed characters; Clean and neatly bound in a report cover	Legible writing, some ill-formed letters, print too small or too large; papers stapled together	Illegible writing; loose pages	Same as below standard
Timelines	Report on time	Report one class period late	Report two class periods late	Report more than one week late	Report more than 10 days late

Continuous Internal Assessment for Project /Internship

For Commerce, Management & Social Work Programme

The Final year Commerce, Management & Social Work students should undergo a project work during (V/VI) semester

- The period of study is for 4 weeks.
- Project / Internship work has to be done in an industrial organization (or) work on any industrial problem outside the organization is allowed.
- Students are divided into groups and each group is guided by a Mentor.
- The group should not exceed four students, also interested student can undergo individually.
- A problem is chosen, objectives are framed, and data is collected, analyzed and documented in the form of a report / Project.
- Viva – Voce is conducted at the end of this semester, by an External Examiner and concerned Mentor (Internal Examiner).
- Project work constitutes 100 marks, out of which 50 is Internal and 50 is External Marks.

Mark Split UP

Internal	External	Total
50	50	100

S. No	Internal Components	Marks
1	Review - I	10
2	Review - II	10
3	Review - III	10
4	Rough Draft Submission	20
Total		**50**

S. No	External Components	Marks
1	Originality of Idea	05
2	Relevance to Current Trend	05
3	Candidate Involvement	05

4	Thesis Style / Language	05
5	Presentation of Report	10
6	Viva-Voce	20
Total		**50**

Continuous Internal Assessment for Project

For Computer Science Cluster

Maximum Marks: 50 Marks

Criterion	Mode of Evaluation	Marks	Total
I	Synopsis, Company Profile, System Specification, Existing System, Proposed System OR (For Android Developments) Planning Stage	10	50
II	Supporting Diagrams like system flowchart, ER, DFD, Usecase and Table Design OR UI and UX Design Application Architect and Prototyping	10	
III	Coding, Input forms, Output format, Testing OR Development, Testing	20	
IV	Preparation of Report & Submission	10	

External Assessment: 50 Marks

Mode of Evaluation	Marks	Total	Grand Total
Project Report			50
Title Relevance of the Industry/Institute	05	30	
Technology	05		
Design and development Publishing	10		
Testing, Report	10		
Viva Voce			
Project Presentation	10	20	
Q&A Performance	10		

COMPUTER SCIENCE PROJECT and VIVA VOCE

Guidelines

Introduction

The title of the project work and the organization will be finalized at the end of fifth Semester. Each student will be assigned with a Faculty for guidance. The Project work and coding will be carried by using the facility of computer science lab as well as in the organization. Periodical review will be conducted to monitor the progress of the project work. Project report will be prepared and submitted at the end of the semester. External examiner appointed by the Controller of Examination will conduct the viva voce examination along with respective guide.

Area of Work

- Web Based Development
- Mobile app development
- Website development
- IoT Projects
- Big Data and Data Mining Projects
- Cloud Computing Projects
- Networking Projects
- Artificial Intelligence and Machine learning Projects
- Data Analytics Projects using Python, R, Tableau etc..
- System Software
- Web Security Projects
- Image Processing

Methodology

Arrangement of Contents

The sequence in which the project report material should be arranged and bound as follows:

1. Cover Page & Title Page
2. Bonafide Certificates
3. Declaration
4. Acknowledgement
5. Synopsis
6. Table of Contents
7. Chapters
8. Appendix
9. References

Format of Table of Contents

TABLE OF CONTENTS

Size of the Project

The Project Report contents should be maximum of not exceeding 70 pages.

SEMESTER I

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI101			**Title**	**Batch:**	2022 - 2025
				Core I: Java Programming	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	60		**Credits:**	4

Course Objective

The course provides insight knowledge about object oriented programming concepts and programming language in Java.

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Develop an in-depth understanding of object-oriented programming concepts	K1
CO2	Explain the various programming language constructs, object oriented concepts like overloading,inheritance, polymorphism, Interfaces , threads, exception handling and packages	K2
CO3	Illustrate the concepts of Applets, files and the concept of stream classes.	K3
CO4	Outline the benefits and applications of objects oriented programming concepts and defend how JAVA differs from other programming languages	K4
CO5	Judge the pros and cons of other object oriented language with the concepts of Java	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	H
CO2	H	H	H	H	H	L	M	L	M	L	H	H

CO3	M	H	M	H	M	L	M	M	M	L	M	H
CO4	M	H	M	H	M	L	H	L	M	L	M	H
CO5	H	M	H	H	L	L	M	L	M	H	H	H

Units	Content	Hrs
Unit I	INTRODUCTION: Introduction to Java - Features of Java - Object Oriented Concepts - Lexical Issues - Data Types - Variables - Arrays - Operators - Control Statements.	12
Unit II	Classes and Objects: Classes - Objects - Constructors - Overloading method - Access Control - Static and fixed methods - Inner Classes - String Class - Inheritance - Overriding methods - Using super- Abstract class.	11
Unit III	Packages: Access Protection - Importing Packages - Interfaces - Exception Handling - Throw and Throws - Thread - Synchronization - Messaging - Runnable Interface - Inter thread Communication - Deadlock - Suspending, Resuming and stopping threads - Multithreading.	12
Unit IV	I/O Streams: File Streams - Applets - String Objects - String Buffer - Char Array - Java Utilities - Code Documentation .	12
Unit V	Networks basics: Socket Programming - Proxy Servers - TCP/IP Sockets - Net Address - URL – Datagrams - Working with windows using AWT Classes - AWT Controls - Layout Managers and Menus.	13
	Total Contact Hrs	**60**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	R.Nageswara Rao	Core Java : An Integrated Approach	John Wiley, ISBN 9789351199250	2016
2	Cay S.Horstmann, Gary Cornell.	Core Java 2 Volume I - Fundamentals	Oracle Press Java,12th Edition.	2022
3	H. Schildt	Java2 The Complete Reference	MCGraw Hill, 11th Edition	2020

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Deital&Deital	Java How to Program	Third Edition, Pearson Education Asia	2012
2	K. Arnold and J. Gosling	The Java Programming Language	Addison Wesley,4th Edition	2005

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Dr. S. Niraimathi Signature	Dr. S. Niraimathi Signature	Mr. K. Srinivasan Signature	Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI102			**Title**	**Batch:**	2022 - 2025
				Core II: Industry 4.0	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	60		**Credits:**	4

Course Objective

To impart knowledge on Industry 4.0, need for digital transformation and the following Industry 4.0 tools: 1. Artificial Intelligence 2. Big Data and Data Analytics 3. Internet of Things

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Know the reason for adopting Industry 4.0 and Artificial Intelligence.	K1
CO2	Understand the need for digital transformation.	K2
CO3	Apply the industry 4.0 tools.	K3
CO4	Analyze the applications of Big Data.	K4
CO5	Examine the applications and security of IoT Applications.	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	M
CO2	H	H	H	H	H	L	M	L	H	L	H	H
CO3	M	M	M	H	M	L	M	M	M	L	H	H
CO4	M	H	M	H	M	L	H	L	M	L	H	L
CO5	H	M	H	H	L	L	M	L	M	H	H	M

Units	Content	Hrs
Unit I	Industry 4.0: Need – Reason for Adopting Industry 4.0 - Definition – Goals and Design Principles - Technologies of Industry 4.0 – Big Data – Artificial Intelligence (AI) – Industrial Internet of Things - Cyber Security – Cloud – Augmented Reality.	12
Unit II	Artificial Intelligence : Artificial Intelligence (AI) – What & Why? - History of AI - Foundations of AI -The AI -environment - Societal Influences of AI - Application Domains and Tools - Associated Technologies of AI - Future Prospects of AI - Challenges of AI .	11
Unit III	Big Data and IoT : Evolution - Data Evolution - Data : Terminologies - Big Data Definitions - Essential of Big Data in Industry 4.0 - Big Data Merits and Advantages - Big Data Components : Big Data Characteristics - Big Data Processing Frameworks - Big Data Applications - Big Data Tools - Big Data Domain Stack : Big Data in Data Science - Big Data in IoT - Big Data in Machine Learning - Big Data in Databases - Big Data Use cases Big Data in Social Causes - Big Data for Industry - Big Data Roles and Skills -Big Data Roles - Learning Platforms; Internet of Things (IoT) : Introduction to IoT - Architecture of IoT - Technologies for IoT - Developing IoT Applications - Applications of IoT - Security in IoT .	12
Unit IV	Applications And Tools Of Industry 4.0: Applications of IoT – Manufacturing – Healthcare – Education – Aerospace and Defense – Agriculture – Transportation and Logistics – Impact of Industry 4.0 on Society: Impact on Business, Government, People. Tools for Artificial Intelligence, Big Data and Data Analytics, Virtual Reality, Augmented Reality, IoT, Robotics.	12
Unit V	Jobs 2030: Industry 4.0 – Education 4.0 – Curriculum 4.0 – Faculty 4.0 – Skills required for Future - Tools for Education – Artificial Intelligence Jobs in 2030 – Jobs 2030 - Framework for aligning Education with Industry 4.0 .	13
	Total Contact Hrs	**60**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	P.Kaliraj& T. Devi Related Online	Higher Education for Industry 4.0 and Transformation to Education 5.0	Contents [MOOC, SWAYAM, NPTEL, Websites etc.] 1 https://nptel.ac.in/courses/106/105/106105195/	2020

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Manoel Carlos Ramon	API Features and Arduino Projects for Linux Programmers‖	Intel® Galileo and Intel® Galileo Gen 2:, Apress	2014
2	Marco Schwartz Yun‖	Internet of Things with the Arduino	Packt Publishing,	2014

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Dr. K.Thilagam Signature	Dr. S. Niraimathi Signature	Mr. K. Srinivasan Signature	Dr. R .ManicaChezian Signature

Programme Code:	B.Sc,			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI1A1			**Title**	**Batch:**	2022 – 2025
				Allied I :Introduction to Linear Algebra	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	60		**Credits:**	4

Course Objective

To introduce the concepts of Numbers, Quantification, sets, logical reasoning, probability and calculus

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Define basic terms and concepts of matrices.	K1
CO2	Comprehend the use of various matrix operations	K2
CO3	Understand the concept of Vector spaces and Basis	K3
CO4	Determine Eigen values and Eigen Vectors	K4
CO5	Determine orthogonal set concept	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	M
CO3	M	H	M	H	M	M	H	M	M	L	H	H
CO4	M	H	M	H	M	L	H	L	M	L	H	M
CO5	H	M	H	H	L	L	M	L	M	H	H	H

Units	Content	Hrs
Unit I	**Systems of Linear equations**:– Row Reduction and Echelon forms – Vector Equations : Vector Equation – The matrix Equation Ax= b- Solution sets of Linear systems	12
Unit II	**Matrix Operations:**The Inverse of a Matrix – Characterizations of Invertible Matrices – Partitioned Matrices – Matrix Factorizations.	12
Unit III	**Vector Spaces and Subspaces:** Null spaces, Column Spaces and Linear Transformations – Linearly Independent Sets, Bases – coordinate systems – The Dimension of a vector space – Rank.	12
Unit IV	**Eigen vectors and Eigen values:**The Characteristic Equation – Diagonalization – Eigen vectors and Linear transformations	12
Unit V	**Innerproduct, Length and Orthogonality:**Orthogonal sets – Orthogonal Projections-The Gram – Schmidt Process.	12
	Total Contact Hrs	**60**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	David C. LaySteven R. LayandJudi J. McDonald	Linear Algebra and Its Applications	Pearsons Publications 5th edition	2016

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ward ChenayDEwid Kincaid	Linear Algebra Theory and Applications,	Jones and Bartlett Publishers, Inc, II edition.	2011

2	Seymorelipschutz .	Beginning Linear Algebra	Tata Mcgraw hill	2005

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Mr S. Earnest Rajadurai Signature	Name:Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI103			**Title**	**Batch:**	2022 - 2025
				Core Lab I Programming Lab in Java	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	75		**Credits:**	2

Course Objective

- To make the student learn an object oriented way of solving problems using java.
- To make the students to write programs using multithreading concepts and handle exceptions.
- To make the students to write programs that connects to a database and be able to perform various front-end operations.

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	To remember and recollect the object oriented concepts	K3
CO2	To get the idea of packages, interfaces and exceptions and AWT	K4
CO3	To validate the projects using front-end and back-end programming	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H

Units	Content
	1. Program to generate Fibonacci series 2. Program to check if the number is prime or not 3. Program to find the factorial of a number 4. Program to emulate a Simple calculator 5. Program to check if the string is a Palindrome or not 6. Program to check if the year is a Leap Year 7. Program to check if the number is an Armstrong number or not 8. Program to demonstrate Multilevel Inheritance. 9. Program to demonstrate Method Overloading. 10. Program to demonstrate Method Overriding. 11. Dynamic Method dispatch. 12. Program to demonstrate interfaces. 13. Program to demonstrate packages. 14. Program to demonstrate user-defined exception. 15. Program to demonstrate Multi-threading concept. 16. Applet program to demonstrate basic controls 17. Program to demonstrate font class. 18. Program to demonstrate Graphics class. 19. Program to demonstrate layout manager. 20. Program to create Menus. 21. Program to demonstrate animation. **22.** Program to demonstrate mouse events and keyboard events
	Total Hours 75

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

SEMESTER II

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI204			**Title**	**Batch:**	2022 - 2025
				Core III: Programming in Python	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	60		**Credits:**	4

Course Objective

To impart knowledge in Core python, advanced concepts like Regular Expressions and Artificial Intelligence & Data Science tools which allow students to apply the concepts to become effective Python programmers.

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the core programming constructs of Python	K1
CO2	Express proficiency in the handling of functions, strings,lists, dictionaries, tuples and sets	K2
CO3	Apply the use of regular expressions and built-in functionsto navigate the file system.	K3
CO4	Illustration of Object-oriented Programming conceptsin Python	K4
CO5	Realize the power of modules like NumPy, pandas, and Altair in developing solutions to problems related to data science	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	M
CO2	H	L	H	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	L	M	M	M	M	H	H
CO4	M	L	M	H	H	L	H	L	M	L	H	H
CO5	H	M	H	H	L	L	M	L	M	H	H	H

Units	Content	Hrs
Unit I	**Introduction:**Identifiers - Keywords - Statements and Expressions - Variables - Operators - Precedence and Associativity - Data Types - Indentation - Comments - Reading Input - Print Output - Type Conversions - The type() Function and Is Operator - Dynamic and Strongly Typed Language. Control Flow Statements - Functions: Built-In Functions - Commonly Used Modules - Function Definition and Calling the Function - The return Statement and void Function- Scope and Lifetime of Variables - Default Parameters - Keyword Arguments - *args and **kwargs - Command Line Arguments.	12
Unit II	**Strings :** Creating and Storing Strings - Basic String Operations - Accessing Characters in String by Index Number - String Slicing and Joining - String Methods - Formatting Strings – Lists: Creating Lists - Basic List Operations - Indexing and Slicing in Lists - Built-In Functions Used on Lists - List Methods - The del Statement**.**	11
Unit III	**Dictionaries:** Creating Dictionary - Accessing and Modifying key:valuePairs in Dictionaries - Built- In Functions Used on Dictionaries - Dictionary Methods - The del Statement - Tuples and Sets:Creating Tuples - Basic Tuple Operations - Indexing and Slicing in Tuples - Built-In Functions Used on Tuples - Relation between Tuples and Lists -Relation between Tuples and Dictionaries - Tuple Methods - Using zip() Function - Sets - Set Methods – Frozenset.	12
Unit IV	**Files:** Types of Files - Creating and Reading Text Data - File Methods to Read and Write Data - Reading and Writing Binary Files - The Pickle Module - Reading and Writing CSV Files - Python os and os.path Modules Regular Expression Operations: Using Special Characters - Regular Expression Methods - Named Groups in Python Regular Expressions - Regular Expression with glob Module.	12
Unit V	**Object-Oriented Programming:** Classes and Objects - Creating Classes in Python - Creating Objects in Python - The Constructor Method - Classes with Multiple Objects - Class Attributes versus Data Attributes - Encapsulation - Inheritance - The Polymorphism –Introduction to Data Science: Functional Programming - JSON and XML in Python - NumPy with Python - Pandas – Altair.	13
	Total Hours	**60**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	S. Gowrishankar, A. Veena,	Introduction to Python Programming,	CRC Press Taylor and Francis Group, Ist Edition	2018

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	E.Balagurusamy	Introduction to Computing and Problem Solving Using Python	McGraw Hill Education1st Edition	2016
2	Wesley J. Chun	Core PythonProgramming	, Pearson Education, 2nd Edition	2009

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI205			**Title**	**Batch:**	2022 - 2025
				Core IV: Data Structures and Algorithms	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	60		**Credits:**	4

Course Objective

- To introduce the concept of data structures and the types of data structures
- To demonstrate how various data structures can be implemented and used in various applications

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Define the concept of Data structure and list the various classifications of data structures.	K1
CO2	Demonstrate how arrays, stacks, queues, linked lists, trees, heaps, Graphs and Hash Tables are represented in the main memory and various operations are performed on those data structures.	K2
CO3	Illustrate the various file organizations like Sequential, Random and Linked organizations.	K3
CO4	Discover the real time applications of the various data structures	K4
CO5	Design algorithms for various sorting and searching techniques	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	M
CO2	H	L	H	H	H	L	M	L	M	L	H	M
CO3	M	H	M	H	H	L	M	M	M	H	H	H
CO4	L	L	M	H	H	L	H	L	M	L	H	M
CO5	H	M	H	H	M	L	L	L	M	H	H	H

Units	Content	Hrs
Unit I	Introduction to Data Structures: Why Data Structures – Operations of Data Structures – Data Types – Arrays and Lists – Representation Of Arrays – Operations On Arrays - Abstract Data Types (ADTs) – List ADT.	12
Unit II	Linear Data Structures: Stack: Operations of Stack – Representation – Implementation – Infix to Postfix Conversion – Postfix Evaluation – Recursion – Maze Problem – Queue: Operations of Queue – Representation – Implementation – Job Processing using Queue – Circular Queue – Double Ended Queue – Linked List: Representation – Implementation – Polynomial Addition – Doubly Linked List – Circular List – Circular Doubly Linked List.	11
Unit III	Non Linear Data Structures: Trees: Terminologies in Trees – Representation – Types of Trees – Forest – Transforming Forest into Binary Trees - Traversal Techniques – Applications of Trees Graphs: Terminologies in Graphs – Representation – Depth First Search – Breadth First Search – Applications of Graphs – Shorest Path- Travelling Salesman Problem – Dijkstra's Algorithm – Types of Graphs.	12
Unit IV	Sorting And Searching: Sorting: Bubble Sort – Selection Sort – Merge Sort – Insertion Sort – Quick Sort – Heap Sort – Searching: Linear Search – Binary Search – Divide and Conquer – Hashing - Hash Table – Direct Address Method – Mapping Function – Handling Collision.	12
Unit V	Complexity And Case Studies: Asymptotic Notation – Big Oh Notation – Omega Notation – Tita Notation – Complexity: Space Complexity – Time Complexity – Space and Time Complexities of Data Structures – Case Studies: Searching for Patterns- Inventing a new sorting Algorithm - Synthesizing Concurrent Graph Data Structures.	13
	Total Hours	**60**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	GavPai,	Data structures and algorithms, concepts, techniques and Applications	McGraw Hill, 1st Edition, ISBN: 9780070667266	2019
2	Horowitz, S. Sahni, and S. Rajasekaran	Computer Algorithms	Galgotia Pub. Pvt. Ltd.,	2012

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	T. H. Cormen, C. E. Leiserson, R. L. Rivest	Introduction to Algorithms	Prentice hall, 3rd Edition	2009

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr.S.Niraimathi Signature	Name: Dr.S.Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UDA2A1			**Title**	**Batch:**	2022 - 2025
				ALLIED II: Optimization Techniques	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	60		**Credits:**	4

Course Objective

- To model linear programs and solving with a computer
- To use Simplex algorithms to solve linear programs & Other algorithms for linear programming,
- To introduce Integer Programming
- To Solve Network problems & Non-linear programming

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	To remember the basic principles and practices of computing grounded in mathematics and science	K1
CO2	To understand the Problems using various linear Algorithms	K2
CO3	To apply algorithms to the decision making problems	K3
CO4	To analyze the programming algorithms with exercises	K4
CO5	To Summarize the inventory and queuing models	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	L	H	M	L	L	L	M	M	H	H
CO2	H	L	H	H	H	L	M	L	M	L	H	M
CO3	M	H	M	H	H	L	M	M	M	H	H	H
CO4	L	L	M	H	H	L	H	L	H	L	H	L
CO5	H	M	H	H	M	H	L	L	H	H	H	H

Units	Content	Hrs
Unit I	**Introduction:** Simplex method – Graphical method – Standard form – IBFS- Artificial Variable technique – Big M Method	12
Unit II	**Transportation :** Mathematical formulation – Initial feasible solution – North – West Corner Method – Matrix minima method – Vogel's approximation method – Optimized basic feasible solution- Solution by UV method Assignment Problem : Introduction – Definition – Assignment algorithm – Balanced Assignment Problem – Unbalanced Assignment problem – Hungarian Method	11
Unit III	**Networks :** Networks and basic components – rules – time calculation in networks – CPM – PERT – PERT Calculations- Resource analysis in network scheduling project cost – time cost optimization algorithm	12
Unit IV	**Inventory :** Introduction – Reasons for carrying Inventory – Type of Inventories – The Inventory decision – EOQ with no Shortages – Production problem with no shortages – EOQ with Shortages – Production problem with shortages- EOQ with Price Breaks – EOQ with no price breaks – EOQ with two price breaks Queuing Theory : Queuing System characteristics – Poisson process and exponential distribution (M/M/1) : (□/FIFO) , (M/M/1) : (N/FIFO) , (M/M/C) : (□ / FIFO) , (M/M/C) : (N/FIFO)	12
Unit V	**Sequencing :** Introduction- problems of sequencing – problems with n jobs and two machines – Problems with n jobs and three machines – problems with n jobs and m machines **Replacement Theory :** Introduction – replacement of equipment or asset the deteriorates gradually – replacement of equipment that fails suddenly	13
	Total Hours	**60**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	KantiSwarup, P.K. Gupta and Man Mohan	Operations Research	Sultan Chand & Sons Educational Publishers, New Delhi.	2008

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	1. P.K. Gupta, D.S. Hira	Problem in Operations Research	S.Chand& Company Ltd.,	2007
2	J.K. Sharma	Operations Research Theory and Applications	Macmillan India Ltd.3rd Edition,	2006
3	Hamdy A. Taha	Operations Research : An Introduction	PHI, New Delhi,8th Edition	2008

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S.Niraimathi Signature	Name: Dr.S.Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI206			**Title**	**Batch:**	2022 - 2025
				Core Lab II Programming Lab in Python	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	75		**Credits:**	2

Course Objective

To give a basic introduction to object-oriented and to demonstrate the concepts of Artificial Intelligence and Data science, using Python

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	To remember the principles of structured programming Recognize and construct common programming idioms: variables, loop, branch, subroutine, and input/output.	K3
CO2	To understand the common programming idioms: variables, loop, branch, subroutine, and input/output	K4
CO3	To figure out ability to analyze and solve the problems using advanced facilities of the Python language	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H

Units	Content
	1. Program to find the factorial of a number using recursion 2. Program to implement the control structures 3. Program to implement the list 4. Program to implement the operations and methods of the String 5. Program to implement the Tuples 6. Program to implement the Dictionaries 7. Program to import and use the system libraries 8. Program to implement the modules 9. Program to implement the standard modules 10. Program to implement Exceptions and Error handling 11. Program to implement Objects and Class 12. Program to demonstrate File handling 13. Program to demonstrate JSON 14. Program to demonstrate Numpy 15. Program to Demonstrate Pandas
	Total Hours 75

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	S. Gowrishankar, A. Veena,	Introduction to Python Programming,	CRC Press Taylor and Francis Group, Ist Edition	2018

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	E.Balagurusamy	Introduction to Computing and Problem Solving Using Python	McGraw Hill Education1st Edition	2016
2	Wesley J. Chun	Core PythonProgramming	, Pearson Education, 2nd Edition	2009

<table>
<tr><td>Programme Code:</td><td colspan="3">B.Sc</td><td>Programme Title:</td><td colspan="2">Bachelor of Science
(Computer Science with AI & ML)</td></tr>
<tr><td rowspan="2">Course Code:</td><td colspan="3" rowspan="2">22UAI207</td><td>Title</td><td>Batch:</td><td>2022 – 2025</td></tr>
<tr><td rowspan="2">Capstone Project - 1</td><td>Semester:</td><td>II</td></tr>
<tr><td>Lecture Hrs./Week
or
Practical Hrs./Week</td><td></td><td>Tutorial Hrs./Sem.</td><td></td><td>Credits:</td><td>2</td></tr>
</table>

SEMESTER III

Programme Code:	B.Sc.			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI308			**Title**	**Batch:**	2022 – 2025
				Database Systems Concepts	**Semester:**	III
Lecture Hrs./Week or Practical rs./Week	**5**	**Tutorial Hrs./Sem.**	**5**		**Credits:**	4

Course Objectives

This course has been designed for students to learn and understand

- To the foundations of of database management systems.
- To give a good formal foundation on the relational model of data.
- To use the database management systems in various real-time applications.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the foundations of database systems.	K2
CO2	Demonstrate the basics of SQL for database	K3
CO3	Execute various advanced SQL queries.	K4
CO4	Apply various normalization techniques on databases.	K4
CO5	Apply and relate the concept of transaction, concurrency control and recovery in database.	K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	M
CO2	H	L	H	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	L	M	M	M	M	H	H
CO4	M	L	M	H	H	L	H	L	M	L	H	H
CO5	H	M	H	H	L	L	M	L	M	H	H	H

Units	Course contents	Hours
Unit I	**Introduction** :Database-System Applications - Purpose of Database Systems - View of Data - Database Languages - Relational Databases - Database Design- Object-Based and Semi structured Databases - Data Storage and Querying - Transaction Management – Data Mining and Analysis - Database Architecture - Database Users and Administrators - History of Database Systems. **Relational model** : Structure of Relational Databases - Fundamental Relational-Algebra Operations - Additional Relational-Algebra Operations - Extended Relational-Algebra Operations - Null Values - Modification of the Database	15
Unit II	**SQL** : Data Definition - Basic Structure of SQL Queries - Set Operations- Aggregatae Functions- Null Values -Nested Subqueries - Complex Queries - Views - Modification of the Database - Joined Relations **Advanced SQL**: Data Types and Schemas - Integrity Constraints - Authorization – Embedded SQL - Dynamic SQL - Functions and Procedural Constructs- Recursive Queries- Advanced SQL Features	15
Unit III	**Database Design and the E-R Model:** Overview of the Design Process - The Entity-Relationship Model - Constraints - Entity-Relationship Diagrams **Relational Database Design:** Features of Good Relational Designs - Atomic Domains and First Normal Form - Decomposition Using Functional Dependencies - Functional-Dependency Theory - Decomposition Using Functional Dependencies - Decomposition Using Multivalued Dependencies - More Normal Forms - Database-Design Process - Modeling Temporal Data. **NoSQL definition** - Relational Vs non-relational database - working with NoSQL - Running MongoDB - Getting A Database Connection - Inserting Data into A Collection - Accessing Data From a Query	15
Unit IV	**ORACLE**: Introduction – CODD's Rule – Tools of ORACLE - Introduction to SQL – Benefits of SQL - Data Types – DDL – DML – DCL - TCL - Data Constraints. ORACLE SQL Functions –Single Row Functions: Date, Number, Miscellaneous, Conversions, Character Functions - Group Functions – SQL Operators: Arithmetic, Comparison and Logical Operators – Set Operators – Joins – Sub Queries – Views	15
Unit V	**PL/SQL** : Introduction–Advantages of PL/SQL – Architecture of PL/SQL – Introduction to PL/SQL Block - Data Types – Control Structures - Concepts of Error Handling – Cursor - Procedure - Functions – Triggers - Types of Triggers.	15

Total	**75**

Text Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	ASilberschatz, H Korth,SSudarshan	Data base System and Concepts", (5th Edn.)	TMH.	2005

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Sadalage, P. & Fowler,	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence,	Pearson Education.	2005
2	Alexix Leon & MathewsLeon	"Essential of DBMS"	(2ndEdn.),Vijay NicolePublications	2009
3	Alexix Leon & Mathews Leon	"Fundamentals of DBMS"	2ndEdn.),Vijay NicolePublications	2014
4	Redmond, E. &Wilson	Seven Databases in Seven Weeks	Pragmatic Bookshelf	2018

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr.B.Azhagusundari Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI309			**Title**	**Batch:**	2022 - 2025
				Introduction to AI	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	5		**Credits:**	4

Course Objectives

To introduce the basic concepts of artificial intelligence and techniques of Machine Learning.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	To remember the basic principles and practices of Typical AI Problems	K1
CO2	To understand problem solving using search strategies and Game playing	K2
CO3	To Choose the suitable machine learning methods/algorithms for various type of learning problems	K3
CO4	To Analyse the Knowledge representation techniques	K4
CO5	To Apply appropriate Linear models to different contexts	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	M
CO2	H	L	H	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	L	M	M	M	M	H	H
CO4	M	L	M	H	H	L	H	L	M	L	H	H
CO5	H	M	H	H	L	L	M	L	M	H	H	H

Unit	Contents	Hours
I	**INTRODUCTION TO AI**: Introduction–Definition – History of AI - Future of Artificial Intelligence – Intelligent Agents: Agents & Environments-The Concept of Rationality – The Nature of Environments - PEAS representation for an Agent–The structure of Agents - Problem Solving Approach to Typical AI problems	15
II	**PROBLEM SOLVING**: Solving problems by Searching – Problem solving Agents- Example Problems –Searching for Solutions - UninformedSearch Strategies–Informed (Heuristics) Search Strategies – Local Search Algorithms and Optimization Problems -Searching with Partial Observations	15
III	**ADVERSARIAL SEARCH**: Games - Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games - Partially observable gamesCONSTRAINT SATISFACTION PROBLEMS:Defining Constraint Propagation problems – inference in CSP's - Backtracking Search for CSP's – Local search for CSP's- The Structure of Problems	15
IV	**LOGICAL AGENTS**: Knowledge Based Agents - Propositional Logic – Propositional Theorem proving- Propositional model Checking - Agents based on propositional logic - FIRST ORDER LOGIC:Syntax and Semantics of First Order Logic – Using First Order Logic-Knowledge Engineering in First Order Logic–Inferences in first-order logic - Unification – Forward Chaining-Backward Chaining – Resolution	15
V	**AI Applications** : Language Models – Information Retrieval – Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition	15
Total		**75**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION

1	Deepak Khemani	"Artificial Intelligence"	Tata McGraw Hill Education	2013
2	Stuart Russel and Peter Norvig	"Artificial Intelligence – A modern approach",(2nd Edn.)	Prentice Hall	2021

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Prachi Joshi, and Parag Kulkarni	Artificial Intelligence: Building Intelligent Systems", (2nd Edn.),	MIT Press	2012
2	Elaine Rich, Kevin Knight and Shiva shankar B Nair	"Artificial Intelligence"	TMH	2010

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI3A1			**Title**	**Batch:**	2022 - 2025
				General Elective 3: Discrete Structures and its Applications	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	5		**Credits:**	4

Course Objectives

Introduce students to the techniques, algorithms, and reasoning processes involved in the study of discrete mathematical structures.
Introduce students to set theory, inductive reasoning, elementary and advanced counting techniques, equivalence relations, recurrence relations, graphs, and trees.
Introduce students to prove mathematical statements by means of inductive reasoning

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand discrete mathematical preliminaries and apply discrete mathematics in formal representation of various computing constructs	K1
CO2	Demonstrate an understanding of relations ,functions, Combinatorics and lattices	K2
CO3	Apply the techniques of discrete structures and logical reasoning to solve a variety of problems and write an argument using logical notation	K3
CO4	Analyze and construct mathematical arguments that relate to the study of discrete structures	K4
CO5	Analyze and construct mathematical arguments that relate to the study of discrete structures	K5

Unit	Course contents	Hours
I	**Relations**: Cartesian product of two sets – Relations – Representation of Relation – Operations on Relations – Equivalence of Relation – Closures and Warshall's Algorithm – Partitions and equivalence classes	15
II	**Coding Theory**: Introduction – Hamming distance – Encoding a Message – Group codes –Procedure for Generating Group Codes – Decoding and error correction – An example of Simple Error Correcting Code.	15

III	**Mathematical Logic**: Introduction – True / False - Statements – Connectives – Atomic and Compound Statements – Well Formed (Statement) Formulae – The truth table of a formula – Tautology – Tautological implications and equivalence of a formula – Normal forms – Principal Normal Forms.	15
IV	**Graph Theory** :Graphs and sub graphs - Operations on Graphs - Isomorphism of Graphs - Walks, paths and cycles - Trees - spanning trees of graph - Algorithm for finding a spanning tree of a connected graph - Krushkal's algorithm to find an optimal tree of a weighted graph.	15
V	**Number Theory:** Divisibility: Divisibility of integer – Division algorithm – Common divisor – Greatest common divisor– The Euclidean algorithm – Primes and Composite Number: Definition of Prime, Composite, Twin prime – Euclid's theorem – Unique factorization theorem – To find GCD & LCM of two integers – Positional representation of on integers – Worked examples	15
Total		**75**

Text Book(s):

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Dr.M.K.Venkataraman, Dr.N.Sridharan, N. Chandarasekaran (Unit – I, II, III)	"Discrete Mathematics"	The National Publishing Company, Chennai	2006
2	S.Kumaravelu& SusheelaKumaravelu (Unit – IV)	"Graph Theory"	JankiCalender Corporation, Sivakasi	1999
3	S.Kumaravelu& SusheelaKumaravelu (Unit – V)	"Elements of Number Theory"	Raja Sankar offset Printers, Sivakasi	2002

Reference Book(s):

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	J.P.Tremblay, R Manohar	"Discrete Mathematical Structures with Applications to Computer Science"	Tata McGraw Hill Education	2007
2	Narsingh Deo	Graph Theory with applications to engineering and computer science	Prentice hall of India, New Delhi	2003

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Mr S. Earnest Rajadurai Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc.			**Programme Title:**	AI and ML	
Course Code:	22UAI310			**Title**	**Batch:**	
				Title Core Lab III : RDBMS Lab	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	5		**Credits:**	2

Course Objective

To make the students to work with relational, Structured and unstructured Databases like SQL, NoSQL and Mongo DB

Course Outcomes

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

CO1	To remember the principles of relational databases.	K3
CO2	To understand the common constructs of relational databases to formulate queries	K4
CO3	To figure out ability to analyze and solve the problems using advanced facilities of SQL	K5

Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H

Contents
To implement the DDLCommands. Implementation of the DDL Commands with KeyConstraints. To Implement the DMLCommands. Implementation of DCL Commands andViews. Write a PL/SQL program to check whether a number is even orodd. DesignaPL/SQLblockofcodeforreversinganumber.. Design a PL/SQL block to calculate the incentive of an employee. Write a PL/SQL program to check whether a given number is positive, negative orzero. Write a PL/SQL program using FOR loop to insert ten rows into a databasetable. Write a PL/SQL program to check whether a given character is letter or digit.
60 Hrs

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr.B.Azhagusundari Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc.			**Programme Title:**	AI and ML	
Course Code:	22UAI311			**Title**	**Batch:**	
				Title Core Lab IV : AI Lab	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	5		**Credits:**	2

Course Objective

To make the students to work with relational AI Concepts

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	To Understand the Typical AI problems	K3
CO2	To Analyze the search strategies	K4
CO3	To implement the Typical problems in AI	K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H

Content

Write a Python Program to implement the Breadth first Search Traversal.
Write a Python Program to implement the Hangman game.
Write a Python Program to sort the sentence in the alphabetical order.
Write a Python Program to implement Tic-Tac –Toe game.
Write a Python Program to implement the Water jug Problem.
Write a Python Program to Find factorial of the given number to implement the simple chat bot.
Implement A* algorithm for the following problems: i) 8 puzzle ii) Missionaries and Cannibals.
Implement and test hill climbing based search algorithms to solve Travelling Salesman Problem.
Solve and implement map coloring problem by backtracking and constraint propagation
Solve and implement towers of Hanoi problem by planning**.**

60 Hrs

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr.S.Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI3N1			**Title**	**Batch:**	2022 - 2025
				Non-Major Elective Paper-I : Internet Concepts	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	1	**Tutorial Hrs./Sem.**			**Credits:**	2

Course Objectives

To give the confidence for the students to build a customized Web Page

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	To Understand the basic internet concepts	K3
CO2	To analyze the Tags required to build a webpage and using the CSS	K4
CO3	To implement the Web Pages	K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H

Contents	
Internet concepts 1. Write a HTML Program for Text Formatting 2. Write a HTML Program to display your education details in a tabular format 3. Write a HTML Program to illustrate the usage of the following: a) Ordered List b)Unordered List Definition List 4. Write a HTML code to create a Home page having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links. 5. Write a HTML Program to create a login form. On submitting the form, the user should get navigated to a profile page 6. Write a HTML Program to demonstrate the Anchor Tag 7. Write a HTML Program to demonstrate inline image 8. Write a program to demonstrate inline CSS 9. Write a HTML program to demonstrate the usage of external CSS 10. Write a HTML program to demonstrate the embedding of sound and video files	
Total	**15**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI3N2			**Title**	**Batch:**	2022 - 2025
				Non-Major Elective Paper-I : Data Processing Through Excel Lab	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	1	**Tutorial Hrs./Sem.**			**Credits:**	2

Course Objectives

To ease the data processing operations by using Excel

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	To understand the basics of Excel	K3
CO2	To analyze the use of Excel in Data Processing	K4
CO3	To implement the Data Processing concepts in Excel	K5

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H

Contents

1. Enter the following data and save it in grade .xls
Name Marks1 Marks2 Marks3 Total Percentage Grade
Amit 80 70 80
Renu 70 60 90
Rajeev 60 50 80
Manish 50 30 90
Sanjeev 40 40 80
Anita 70 70 90
Do the following
(a) Compute the total marks and percentage of each student by entering appropriate formula.
(b) Draw a border around the worksheet
(c) Change the font size of heading to 14 points and underline it and hide column c
(d) Increase the width of column A to 15 characters
(e) Right Align the values in column B, C, F

2. Create a sheet containing Nation-wide sales results for Avon Helmets-Region, Vendor name,Helmet type, Helmet Color and Total sales. a. Sort the data by Region, Vendor name and sales. b. Sort the data according to a custom list of Helmet Color - Red, Blue, Yellow and Green. 3. Create a sheet containing Nation-wide sales results for Avon Helmets- Region, Vendor name Helmet type, Helmet Color and total sales. a. Use Filtering on Region and Helmet type. b. Use subtotal function to count the number of records and sum of sales for the filtered records. 4. Use Query Wizard to filter East, West Region transaction and sort them on Region and Total sales. 5. Perform the following a. Create a list of vendor and total sales by consolidating the total sales. b. Compute sub totals with no detail data. c. Create Subtotals by both Region and Vendor within Region. 6. Create a PIVOT TABLE to show the sales results by Region and Helmet type and summarize the total sales. 7. Create a PIVOT chart for the pivot table of total sales for the Region and Helmet types. 8. Create a bar chart to show the sales results for different Helmet type and to the following formats. a. Add a Secondary axis. b. Create picture markers.	
Total	**15**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

SEMESTER IV

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI412			**Title**	**Batch:**	2022 - 2025
				Cloud Computing	**Semester:**	III
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**			**Credits:**	4

Course Objectives

To understand the concepts in Cloud Computing and its Security
To understand the evolving computer model, cloud computing.
To introduce the various levels of services that can be achieved by cloud.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	To remember the basic concepts of Cloud computing	K1
CO2	To understand levels of services of Cloud	K2
CO3	To explain and apply Concepts of Cloud	K3
CO4	To Analyze the security aspects in the cloud	K4
CO5	To Apply appropriate Linear models to different contexts	K5

Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**
CO1	H	H	H	H	M	L	M	L	M	M	H	M
CO2	H	L	H	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	L	M	M	M	M	H	H
CO4	M	L	M	H	H	L	H	L	M	L	H	H
CO5	H	M	H	H	L	L	M	L	M	H	H	H

Unit	**Contents**	**Hours**
I	Cloud Computing Foundation: Introduction to Cloud Computing – Move to Cloud Computing – Types of Cloud – Working of Cloud Computing	12

II	Cloud Computing Architecture : Cloud Computing Technology – Cloud Architecture – Cloud Modeling and Design - Virtualization : Foundation – Grid, Cloud and Virtualization – Virtualization and Cloud Computing	12
III	Data Storage and Cloud Computing : Data Storage – Cloud Storage – Cloud Storage from LANs to WANs – Cloud Computing Services : Cloud Services – Cloud Computing at Work	12
IV	Cloud Computing and Security : Risks in Cloud Computing – Data Security in Cloud – Cloud Security Services – Cloud Computing Tools : Tools and Technologies for Cloud – Cloud Mashups – Apache Hadoop – Cloud Tools	12
V	Cloud Applications – Moving Applications to the Cloud – Microsoft Cloud Services – Google Cloud Applications – Amazon Cloud Services – Cloud Applications	12
Total		**60**

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	A.Srinivasan and J.Suresh	Cloud Computing – A Practical Approach for Learning and Implementation	Pearson India Publications	2014

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	RajkumarBuyya, James Broberg, Andrzej	Cloud Computing: Principles and Paradigms	Wiley India Publications	2011
2	ArshdeepBahga and Vijay Madisetti	Cloud Computing – A Hands on Approach	Universities Press (India) Pvt Ltd	2014

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	**B.Sc.**			**Programme Title:**	**AI and ML**	
Course Code:	**22UAI413**			**Title**	**Batch:**	
				Title: Core Introduction to Machine Learning	**Semester:**	**IV**
Lecture Hrs./Week or Practical Hrs./Week	**4**	**Tutorial Hrs./Sem.**	**5**		**Credits:**	**5**

Course Objective

- To understand basic concepts of machine learning
- Understand how to evaluate models generated from data
- Discover how to build machine learning algorithms, prepare data, and use different techniques using Python

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	To remember the concept of Machine learning techniques and mathematical concepts in ML	**K1**
CO2	Understand a wide variety of learning algorithms.	**K2**
CO3	Understand how to evaluate models generated from data	**K3**
CO4	Provide a way to evaluate performance of machine learning algorithms.	**K3**
CO5	Apply the algorithms to a real-world problem and optimize the models learned.	**K4**

Mapping

PO /PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	**L**	**M**	**H**	**M**	**M**	**M**	**L**	**L**	**L**	**L**	**H**	**M**
CO2	**M**	**L**	**L**	**L**	**M**	**H**	**M**	**M**	**M**	**M**	**H**	**H**
CO3	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**H**
CO4	**S**	**M**	**L**	**L**	**L**	**M**	**L**	**L**	**L**	**L**	**H**	**L**
CO5	**M**	**M**	**L**	**H**	**M**	**H**	**M**	**M**	**M**	**M**	**M**	**H**

Unit	Course contents	Hours
I	Introduction: Machine Learning Foundations – Overview – Design of a Learning System – Types of Machine Learning –Supervised Learning and Unsupervised Learning – Applications of Machine Learning - Overview of Tools for ML.	12
II	Supervised Learning – I: Simple Linear Regression – Multiple Linear Regression – Polynomial Regression – Ridge Regression – Lasso Regression – Evaluating Regression Models – Model Selection – Bagging – Ensemble Methods.	12
III	Supervised Learning – II: Classification – Logistic Regression – Decision Tree Regression and Classification – Random Forest Regression and Classification – Support Vector Machine Regression and Classification - Evaluating Classification Models.	12
IV	Unsupervised Learning: Clustering – K-Means Clustering – Density-Based Clustering – Dimensionality Reduction – Collaborative Filtering.	12
V	Association Rule Learning: Association Rule Learning – Concepts related to ARL – ARL Algorithms - Apriori – Eclat – Concepts and Algorithms..	12
Total		**60**

TEXT BOOK:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Kevin P. Murphy	Machine Learning: A Probabilistic Perspective	MIT Press	2012

REFERENCE BOOKS:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	EthemAlpaydin,	Introduction to Machine Learning	MIT Press, Third Edition	2014
2	Tom Mitchell	Machine Learning	McGraw-Hill, 1997	1997
3	Sebastian Raschka, VahidMirjilili	Python Machine Learning and deep learning",	kindle book,2nd edition	2018
4	Carol Quadros	Machine Learning with Python, Scikit-learnand Tensorflow",	Packet Publishing,	2018

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	**B.Sc.**			**Programme Title:**	**AI and ML**	
Course Code:	**22UAI4A1**			**Title**	**Batch:**	
				Title: General Elective 4: Mathematics for ML	**Semester:**	**IV**
Lecture Hrs./Week or Practical Hrs./Week	**4**	**Tutorial Hrs./Sem.**	**5**		**Credits:**	**4**

Course Objective

This course provides basics for understanding concept of statistics

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	To remember the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.	**K1**
CO2	Understanding of the strengths and weaknesses of many popular machine learning approaches.	**K2**
CO3	Understand the concepts of computational learning theory and Sample data	**K3**
CO4	Appreciate the underlying the concept of NFA	**K4**
CO5	Apply the algorithms to a real-world problem, optimize the models learned.	**K5**

Mapping

PO /PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	**L**	**M**	**H**	**M**	**M**	**M**	**L**	**L**	**L**	**L**	**H**	**M**
CO2	**M**	**L**	**L**	**L**	**M**	**H**	**M**	**M**	**M**	**M**	**L**	**H**
CO3	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**H**	**L**
CO4	**S**	**M**	**L**	**L**	**L**	**M**	**L**	**L**	**L**	**L**	**L**	**M**
CO5	**M**	**M**	**L**	**H**	**M**	**H**	**M**	**M**	**M**	**M**	**H**	**H**

Unit	Course Contents	Hours
I	Introduction – Population – Sample – Parameter and Statistic - Sampling distribution - Null hypothesis – alternate hypothesis – Type I & II errors – Size of Type I & Type II errors – Critical region - One tail and Two tail test – Large Sample tests for : Specified Mean, Equality of Population Means, Specified Proportions – Equality of two Proportions – Confidence Interval – definition - Simple Problems	12
II	Small Samples: t – test. Test for Specified mean, Test for equality of Population means - Test for paired observations – Chi – Square Test: Test for significance of difference between observed and expected frequencies – Test for independence of attributes – 2 X 2, 2 X 3 and 3 X 2 contingency table - Simple Problems.	12
III	Analysis of Variance: Definition – One way classification –Two way classification - related problems.	12
IV	Finite Automata: Definition – Representation of a Finite Automaton – Acceptability of a string by a Finite Automaton – Language accepted by a Finite Automaton – Nondeterministic Finite Automata – Acceptability of a string by NFA – Procedure for finding an FA equivalent to a given NFA - Problems	12
V	Phrase – Structure Grammars – Derivations in a grammar G – Chomsky Hierarchy of Languages – Finite Automata and Regular Languages – Derivation trees for context free Grammars – Normal Forms for Context free Grammars – Worked examples	12
Total		**60**

Text Book(s):

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	P.R. Vittal,	Mathematical Statistics	Margham Publications, Chennai	2015
2	Dr.M.K.Venkataraman, Dr.N.Sridharan and N.Chandrasekaran,	Discrete Mathematics	Th National Publishing Company, Chennai	2006

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION

1	S.P.Gupta	Statistical Methods	Sultan Chand & Sons, New Delhi, 44th Revised Edition	2014
2	Gupta, S.C. and Kapoor V.K	Fundamentals of Mathematical Statistics	S. Chand & Sons	2016
3	R.S.Bharadwaj	Business Statistics	Excel Book	2006
4	Dr.N.Murugesan,	Principles of Automata Theory and Computation	Sahithi Publication, Coimbatore, First Edition	2004

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	**B.Sc.**			**Programme Title:**	**AI and ML**	
Course Code:	**22UAI414**			**Title**	**Batch:**	
				Title	**Semester:**	**IV**
Lecture Hrs./Week or Practical Hrs./Week	**4**	**Tutorial Hrs./Sem.**	**5**	**MACHINE LEARNING LAB**	**Credits:**	**2**

Course Objective

To focus on the Machine learning Techniques**.**

Course Outcomes

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

CO Number	**CO Statement**	**Knowledge Level**
CO1	Understand the basic concepts and techniques of Machine Learning.	K3
CO2	Explain the regression methods, classification methods, clustering methods.	K4
CO3	Demonstrate Dimensionality reduction Techniques	K5

Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H

Content

1. Write a program to implement the Simple and Multiple Linear Regression
2. Write a program to implement the Polynomial Regression
3. Write a program to implement the Bagging Technique
4. Write a program to implement the Adaboost Methods
5. Write a program to implement Logistic Regression algorithm
6. Write a program to demonstrate the workflow of Decision Tree Classification
7. Write a program to implement the Random Forest Classification
8. Write a program to implement the SVM Classification
9. Write a program to perform the K Means Clustering
10. Write a program to perform the Density based Clustering
11. Write a program to implement the Apriori algorithm for market basket analysis
12. Write a program to compare the Supervised Machine Learning algorithms.

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	**B.Sc.**			**Programme Title:**	**AI and ML**	
Course Code:	**22UAI415**			**Title**	**Batch:**	
				Title **Capstone Project II**	**Semester:**	**IV**
Lecture Hrs./Week or Practical Hrs./Week	**1**	**Tutorial Hrs./Sem.**			**Credits:**	**2**

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	23UAI205			**Title**	**Batch:**	2022 - 2025
				Block chain Technology	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	2	**Tutorial Hrs./Sem.**			**Credits:**	2

Course Objectives

To introduce the basic concepts of artificial intelligence and techniques of Machine Learning.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic concepts of Blockchain technology.	K1
CO2	Identify the working of blockchain	K2
CO3	Describe the Technology Stack for Blockchain	K3
CO4	Discuss the Network component of Block Chain	K4
CO5	Analyse and implement the use cases of Blockchain	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	M
CO2	H	L	H	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	L	M	M	M	M	H	H
CO4	M	L	M	H	H	L	H	L	M	L	H	H
CO5	H	M	H	H	L	L	M	L	M	H	H	H

Unit	contents	Hours
I	Introduction to Blockchain Technology - History of Blockchain - Features of Blockchain - Important Blockchain Terminologies - Different Versions of Blockchain - Types of Blockchain - Public Blockchain - Private Blockchain - Hybrid Blockchain - Consortium Blockchain - Applications of Blockchain - Advantages and Disadvantages of Blockchain - Benefits of Blockchain Technology	6
II	Working of a Blockchain Work - Need of Blockchain - Peer-to-Peer Network – Decentralization of Block Chain - Ledger- Blockchain Distributed Ledger - Difference between Centralized and Distributed Ledgers - Difference between Public and Private Ledgers	6
III	Blockchain Architecture - Blockchain Structure - Genesis Block in Blockchain - Candidate Block in Blockchain - Actors Involved in Blockchain Solution - Blockchain Transaction Life-cycle - Blockchain Forks - Blockchain and Block Header	6
IV	Components of Blockchain Network - Blockchain Incentives to Miners - Core Component of Blockchain - Blockchain Protocols and their Working - Resolving Conflicts in Blockchain -Blockchain Authentication	6
V	Blockchain and Cryptocurrency - BlockchainCryptocurrency – Benefits of Cryptocurrencies – Blockchain–Electronic Cash - Blockchain Wallet – Features - Working of Blockchain Wallet - Blockchain Applications - Top Applications of Blockchain in the Real World - Integration of Artificial Intelligence and BlockChain - Use Cases of BlockChain in different fields	6
Total		**30**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Daniel Drescher	“Blockchain Basics: A Non-Technical Introduction in 25 Steps”	APress	2017

2	Dr. Beaulah David, Dr. H Shaheen&Dr. George Fernandez I	"Blockchain Technology Handbook"	Notion Press	2022

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Parikshit Jain	A Practical Guide To Blockchain And Its Applications	Bloomsbury India, 1st Edition	2019
2	Kumar Saurabh&AshutoshSaxena	Blockchain Technology Concepts And Applications	Wiley	2020

Online Resources/Web references

https://www.geeksforgeeks.org/blockchain

https://www.javatpoint.com/blockchain-tutorial

https://www.simplilearn.com/tutorials/blockchain-tutorial

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
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Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI4N1			**Title**	**Batch:**	2022 - 2025
				Non-Major	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	1	**Tutorial Hrs./Sem.**		**Elective Paper-II** : Web Technology Lab	**Credits:**	2

Course Objectives

The objectives of this course are to have a practical understanding about how to write PHP code to solve problems.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Obtain knowledge and develop application programs using PHP	K3
CO2	Create dynamic Web applications such as content management, user registration, and e-commerce using PHP and to understand the ability to post and publish a PHP website.	K4
CO3	Develop a MySQL database and establish connectivity using MySQL.	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H

Content	
1. Write a PHP program which adds up columns and rows of given table 2. Write a PHP program to compute the sum of first n given prime numbers 3. Write a PHP program to find valid an email address 4. Write a PHP program to convert a number written in words to digit. 5. Write a PHP script to delay the program execution for the given number of seconds. 6. Write a PHP script, which changes the colour of the first character of a word 7. Write a PHP program to find multiplication table of a number. 8. Write a PHP program to calculate Factorial of a number. 9. Write a PHP script to read a file, reverse its contents, and write the result back to a new file 10. Write a PHP script to look through the current directory and rename all the files with extension .txt toextension .xtx. 11. Write a PHP script to read the current directory and return a file list sorted by last modification time. (usingfilemtime()) 12. Write a PHP code to create a student mark sheet table. Insert, delete and modify records.	
Total	**15**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	22UAI4N1			**Title**	**Batch:**	2022 - 2025
				Non-Major Elective Paper-II : Web Application Using Photoshop	**Semester:**	IV
Lecture Hrs./Week or Practical Hrs./Week	1	**Tutorial Hrs./Sem.**			**Credits:**	2

Course Objectives

The objectives of this course are to have a practical understanding about how to build web Application using Photoshop

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Obtain knowledge and develop Web Application using Photoshop	K3
CO2	Create dynamic Web applications using Photoshop	K4
CO3	Develop a Web page and build hybrid web application employing Photoshop	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H

Content	
1. Working with the clone stamp tool 2. Drawing Watch using custom shapes 3. Testing lab mode 4. Using multichannel mode 5. Using the sponge Tool 6. Antique framing 7. Creating a supernova 8. Adding an arrowhead. 9. Isolating a Complex Image 10. Removing an element from an image 11. Captain kirk myopia effect 12. Adjusting the focus 13. Creating an edge mask 14. Applying Transformations 15. Correcting brightness and contrast.	
Total	**15**

Course Designed by	**Head of the Department**	**Curriculum Development Cell**	**Controller of the Examination**
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Name: Dr. S. Niraimathi Signature	Name: Dr. S. Niraimathi Signature	Name: Mr. K. Srinivasan Signature	Name: Dr. R .ManicaChezian Signature

COMPUTER SCIENCE PROJECT and VIVA VOCE

Guidelines

Introduction

The title of the project work and the organization will be finalized at the end of fifth Semester. Each student will be assigned with a Faculty for guidance. The Project work and coding will be carried by using the facility of computer science lab as well as in the organization. Periodical review will be conducted to monitor the progress of the project work. Project report will be prepared and submitted at the end of the semester. External examiner appointed by the Controller of Examination will conduct the viva voce examination along with respective guide.

Area of Work

- Web Based Development
- Mobile app development
- Website development
- IoT Projects
- Big Data and Data Mining Projects
- Cloud Computing Projects
- Networking Projects
- Artificial Intelligence and Machine learning Projects
- Data Analytics Projects using Python, R, Tableau etc..
- System Software
- Web Security Projects
- Image Processing

Methodology

Arrangement of Contents

The sequence in which the project report material should be arranged and bound as follows:

10. Cover Page & Title Page
11. Bonafide Certificates
12. Declaration
13. Acknowledgement
14. Synopsis
15. Table of Contents
16. Chapters
17. Appendix

18. References

Format of Table of Contents

TABLE OF CONTENTS

Size of the Project

The Project Report contents should be maximum of not exceeding 70 pages.