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 2023-2026

Department of Computer Science with Artificial Intelligence & Machine learning

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.

Program Educational Objectives:

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.

Program Outcomes:

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:

PSO - 01	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.
PSO - 02	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.

Mapping

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

DEPARTMENT OF COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

(FOR THE CANDIDATES ADMITTED FROM THE ACADEMIC YEAR 2023 - 2024 ONWARDS)

I to II SEMESTERS

SCHEME OF EXAMINATIONS

SEMESTER - I										
Part	**Subject Code**	**Title of the Paper**	**Hrs. / Week**		**Hrs. / Sem.**	**Exam Hrs.**	**Maximum Marks**		**Total Marks**	**Credits**
			L	**P**	**T**		**Internal**	**External**		
I	23UTL1C1/ 23UTL1C2/	Tamil Paper-I: / Tamil paper-I:	5	-	5	3	25	75	100	3
	23UHN1C1/ 23UHN1C2	HindiPaper-I : / Hindi Paper-I								
	23UFR1C1 / 23UFR1C2	FrenchPaper-I / French Paper-I								
II	23UEN1C1/ 23UEN1C2	EnglishPaper-I/ English Paper-I	5	-	5	3	25	75	100	3
III	23UAI101	**CC I**: Programming in C	5		5	3	25	75	100	4
	23UAI102	**CC II**: Data Structures and Applications	4		4	3	25	75	100	4
	23UAI1A1/ 23UAI1A2	**GE I – Allied I:** Introduction to Linear Algebra / Discrete Mathematics	4		4	3	25	75	100	4
	23UAI103	**CC Lab I**: Programming in C Lab		5	5	3	20	30	50	2
IV	23EVS101	**AECC I**: Environmental Studies	1	-	1	-	-	-	-	-
	23HEC101	Human Excellence: Personal Values & SKY Yoga Practice - I	1	-	1	2	20	30	50	1
V		Extension Activities (NSS, NCC,S ports& Games, etc.,)	-	-	-	-	-	-	-	-
EC		Online Course(Optional) (MOOC / NPTEL / SWAYAM)								Grade
Total			**30**						**600**	**21**

EC – Extra Credit Course / Certificate Course / Co-scholastic Course / Job Oriented Course

CC – Core Course; GE – Generic Elective; AECC - Ability Enhancement Compulsory Course

SEMESTER - II										
Part	**Subject Code**	**Title of the Paper**	**Hrs. / Week**		**Hrs. / Sem.**	**Exam Hrs.**	**Maximum Marks**		**Total Marks**	**Credits**
			L	**P**	**T**		**Internal**	**External**		
I	23UTL2C2	TamilPaper-II	5	-	5	3	25	75	100	3
	23UHN2C2	Hindi Paper-II								
	23UFR2C2	French Paper-II								
II	23UEN202 / 23UEN203	Communication Skills – II (Level I) /Communication Skills – II (Level II)	5	-	5	3	25	75	100	3
III	23UAI204	**CCIII**: Java Programming	4		4		25	75	100	3
	23UAI205	**CC IV**: Operating Systems	4		4		25	75	100	3
	23UAI2A1/2 3UAI2A2	**GE II – Allied II**: Probability& Statistics / Optimization Techniques	4		4		25	75	100	3
	23UAI206	**CCLab II**: Java Programming Lab		4	4		20	30	50	2
	23UAI2S1/ 23UEL2S2	**SEC I**: Naan Mudhalvan: Industry 4.0/Professional Skills	2		2		20	30	50	2
IV	23EVS201	**AECC I**: Environmental Studies	1		2	2	-	50	50	2
	23HEC202	Human Excellence : Family Values & SKY Yoga Practice - II	1		2	2	20	30	50	1
V		Extension Activities (NSS,NCC,Sports& Games, etc.,)	-	-	-	-	-	-	-	-
EC	23CMM201	Manaiyiyal Mahathuvam-I			15 Hrs.	2	-	50	50	Grade
	23CUB201	Uzhavu Bharatham– I			15 Hrs.	2	-	50	50	Grade
	23UAI2VA	VAC-I			45 hrs					3*
					30 hrs					2*
		OnlineCourse(Optional)(MOOC/NPTEL/SWAYAM)								
Total			**30**						**800**	**25**

EC – Extra Credit Course / Certificate Course / Co-scholastic Course / Job Oriented Course

CC – Core Course; GE – Generic Elective; AECC - Ability Enhancement Compulsory Course;

SEC – Skill Enhancement Course

Question Paper Pattern

(Based on Bloom's Taxonomy)

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

1. Theory Examinations: 75 Marks (Part I, II, & III)

(i) Test- I & II, ESE:

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q1 - 10)	A (Q1 – 5 MCQ) (Q6 – 10 Define / Short Answer / MCQ)	10 * 1 = 10	MCQ / Define	**75**
K3 (Q11-15)	B (Either or pattern)	5 * 5 = 25	Short Answers	
K4 & K5 (Q16 – 20)	C (Either or pattern)	5 * 8 = 40	Descriptive/ Detailed	

2. Theory Examinations: 38 Marks (3 Hours Examination) (Part III: If applicable)

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q1 - 10)	A (Q 1 – 10 MCQ)	10 * 1 = 10	MCQ	**50 (Reduced to 38)**
K3 (Q11 – 15)	B (Either or pattern)	5 * 3 = 15	Short Answers	
K4 & K5 (Q16-20)	C (Either or pattern)	5 * 5 = 25	Descriptive/ Detailed	

3. Theory Examinations: 38 Marks (2 Hours Examination) (Part IV: If applicable)

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q1-10)	A (Q1 – 5 MCQ) (Q6–10 Define / Short Answer)	10 * 1 = 10	MCQ / Define	**50 (Reduced to 38)**
K3, K4 & K5 (Q11-15)	B (Either or pattern)	5 * 8 = 40	Descriptive/ Detailed	

4. Practical Examinations:

Paper	Maximum Marks	Marks for		Components for CIA		
		CIA	CEE	Tests	Observation Note	Record Note
Practical (Core / Elective)	50	20	30	10	05	05
Practical (Core / Elective)	75	30	45	20	05	05
Practical (Core / Elective)	100	40	60	30	05	05

5. Project:

Paper	Maximum Marks	Marks for		
		CIA	CEE	
			Evaluation	Viva-voce
Project	100	25	50	25
Project	150	40	75	35
Project	200	50	100	50

***** CIA – Continuous Internal Assessment & CEE – Comprehensive External Examinations

Components of Continuous Internal Assessment (CIA)

THEORY

Maximum Marks: 100; CIA Mark: 25; CEE Mark: 75;

Components		Calculation	CIA Total
Test 1	75	(75+75+15+10)/7	25
Test 2 / Model	75		
Assignment / Digital Assignment	15		
Others*	10		

*Others may include the following: Seminar / Socratic Seminars,Group Discussion, Role Play, APS, Class participation, Case Studies Presentation, Field Work, Field Survey, Term Paper, Workshop / Conference Participation, Presentation of Papers in Conferences, Quiz, Report / Content Writing, etc.

Maximum Marks: 50; CIA Mark: 12; CEE Mark: 38; (Part III: If applicable)

Components		Calculation	CIA Total
Test 1	50	(50+50+10+10)/10	12
Test 2 / Model	50		
Assignment / Digital Assignment	10		
Seminar	10		

PROJECT

Maximum Marks: 100; CIA Mark: 25; CEE Mark: 75;

Components		Calculation	CIA Total
Review I	5	5+5+5+10	25
Review II	5		
Review III	5		
Report Submission	10		

Maximum Marks: 200; CIA Mark: 50; CEE Mark: 150;

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

** 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.

Continuous Internal Assessment for Project

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 25 is CIA and 75 is CEE Marks.

Mark Split UP

CIA	CEE	Total
25	75	100

S. No	Components for CIA	Marks
1	Review – I *	5
2	Review – II *	5
3	Review – III *	5
4	Rough Draft Submission	10
Total		**25**

* Review includes Objectives and Scope, Research Methodology, Literature Review, Data Analysis and Results, Discussion and Interpretation, Recommendations and Implications, Presentation and Format, Creativity and Originality, and Overall Impact and Contribution.

S. No	Components for CEE	Marks
1	Evaluation*	50
2	Viva-Voce	25
Total		**75**

* Evaluation includes Originality of Idea, Relevance to Current Trend, Candidate Involvement, Thesis Style / Language, and Presentation of Report.

Continuous Internal Assessment for Project

For Science Stream

The Final year Science 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 200 marks, out of which 50 is CIA and 150 is CEE Marks.

Mark Split UP

CIA	CEE	Total
50	150	200

S. No	Components for CIA	Marks
1	Review – I *	10
2	Review – II *	10
3	Review – III *	10
4	Rough Draft Submission / Report Submission	20
Total		**50**

*** Review I: -** Problem Analysis

*** Review II: -** Data collection & Design

*** Review III: -** Data Analysis

S. No	Components for CEE	Marks
1	Evaluation *	100
2	Viva-Voce	50
Total		**150**

* Evaluation includes Problem and Hypothesis, Experimental Design / Materials / Procedure, Variables / Controls / Sample Size, and Data Collection / Analysis.

Continuous Internal Assessment for Project

For Computer Science Cluster

Maximum Marks: 100 Marks

Components for CIA: 25 Marks

Criterion	Mode of Evaluation	Marks	Total
I	Synopsis, Company Profile, System Specification, Existing System, Proposed System OR (For Android Developments) Planning Stage	05	25
II	Supporting Diagrams like system flowchart, ER, DFD, Usecase and Table Design OR UI and UX Design Application Architect and Prototyping	05	
III	Coding, Input forms, Output format, Testing OR Development, Testing	05	
IV	Preparation of Report & Submission	10	

ComponentsforCEE: 75 Marks

ComponentsforCEE	Marks	Total	Grand Total
Evaluation			75
Title Relevance of the Industry/Institute	10	50	
Technology	10		
Design and Development Publishing	10		
Testing, Report	20		
Viva Voce			
Project Presentation	10	25	
Q&A Performance	15		

COMPUTER SCIENCE PROJECT and VIVA VOCE

Guidelines

Introduction

The title of the project work and the organization will be finalized at the end of the 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 the computer science lab as well as in the organization. The periodical review will be conducted to monitor the progress of the project work. The project report will be prepared and submitted at the end of the semester. An external examiner appointed by the Controller of Examination will conduct the viva voce examination along with a 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

Chapter No. Title Page No.

4 Implementation and Testing

4.1 Coding Methods

4.2 Testing Approach

4.3 Implementation and Maintenance

5 Project Evaluation

5.1 Project Outcome

5.2 Limitations of the Project

5.3 Further Scope of the Project

6 Conclusion

7 Appendix

7.1 Source Code

7.2 Screenshots and Reports

8 References

Size of the Project

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

STUDENT SEMINAR EVALUATION RUBRIC

Grading Scale:

A	B	C	D
8-10	5-7	3-4	0-2

CRITERIA	A - Excellent	B - Good	C - Average	D - Inadequate
Organization of presentation	Information presented as an interesting story in a logical, easy-to-follow sequence	Information presented in logical sequence; easy to follow	Most of the information is presented in sequence	Hard to follow; sequence of information jumpy
Knowledge of the 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 a grasp of information; answered only rudimentary Questions **&** Material not clearly related to the topic **OR** background dominated seminar

Presentation Skills using ICT Tools	Uses graphics that explain and reinforce text and presentation	Uses graphics that explain the text and presentation	Uses graphics that relate to text and presentation	Uses graphics that rarely support text and presentation
Eye Contact	Refers to slides to make points; engaged with the audience	Refers to slides to make points; eye contact the majority of the time	Refers to slides to make points; occasional eye contact	Reads most slides; no or just occasional eye contact
Elocution – (Ability to speak English language)	Correct, precise pronunciation of all terms The voice is clear and steady; the audience can hear well at all times	Incorrectly pronounces a few terms Voice is clear with few fluctuations; the 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
13-15	10-12	7-9	4-6	0-3

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 the writing is interesting	Hits in basic content and writing are 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 the topic * Words convey intended message	* Word choice is basic * Most writing language is appropriate to the topic * Informal language	* Word choice is vague * Writing language is not appropriate to the 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
Timeliness	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

SEMESTER I

Programme Code:	B.Sc			**Programme Title:**	Bachelor of Science (Computer Science with AI & ML)	
Course Code:	23UAI101			**Title**	**Batch:**	2023 - 2026
				Core I: Problem solving and Programming in C	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	5		**Credits:**	4

Course Objective

The course provides insight knowledge about C programming language.

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals of C Language.	K2
CO2	Apply the control statements in programs	K2
CO3	Understand the representation and usage of arrays.	K2
CO4	Develop programs using functions and storage classes.	K3
CO5	Execute programs with pointers and files	K3

Mapping

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

Units	Content	Hrs
Unit I	**Introduction to Programming:** Computer Systems –Computer Hardware – Computer Software – Classification of Computer Software – Programming Languages – Generation of Programming Languages - Types of Computing Environments – Computer Languages – Language Translators – Creating and Running Programs - Pseudo code – Algorithm – Flow Charts – System Development- Overview of C – History of C -	15

	Features of C	
Unit II	**Introduction** - Character set - C tokens - keyword & Identifiers - Constants - Variables - Data types - Declaration of variables - Assigning values to variables - Defining Symbolic Constants - Arithmetic, Relational, Logical, Assignment, Conditional, Bitwise, Special, Increment and Decrement operators - Arithmetic Expressions - Evaluation of expression - precedence of arithmetic operators - Type conversion in expression – operator precedence &Associatively - Mathematical functions - Reading & Writing a character - Formatted input and output.	15
Unit III	**Decision Making and Branching:** Introduction – if, if….else, nesting of if …else statements- else if ladder – The switch statement, The ?: Operator – The goto Statement. Decision Making and Looping: Introduction- The while statement- the do statement – the for statement-jumps in loops. **Arrays and Strings :** Arrays-One Dimensional Array-Two Dimensional Arrays-Initializing Two Dimensional Arrays-Multi Dimensional Arrays-Handling of CharacterStrings-Declaring and Initializing String Variables-Reading Strings from terminal-Writing Strings to Screen-Arithmetic Operations on Characters-Putting Strings Together-Comparison of Two strings-String Handling Functions	15
Unit IV	**User-Defined Functions:** Introduction – Need and Elements of User-Defined Functions- Definition- Return Values and their types - Function Calls – Declarations – Category of Functions- Nesting of Functions - Recursion – Passing Arrays and Strings to Functions - The Scope, Visibility and Lifetime of Variables- Multi file Programs- **Structures and Unions**-Structures-Definition-Giving Values to membersStructure Initialization- Comparison of Structure Variables-Arrays of Structures-Arrays with Structures - Structures and Functions-Unions-Size of Structures	15
Unit V	**Pointers and Files**: Pointers - Declarations - Advantages of pointers - Passing pointers to Functions - Operation in Pointers - Pointer and Arrays - Arrays of Pointers - Structures and Pointers - Pointer arithmetic. File Management in C-Defining and Opening a File-Closing a File-I/O Operation on Files-Error Handling during I/O Operations-Random Access Files-File Inclusion-Compiler Control Directives.	15
	Total Contact Hrs	**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	E.Balagurusamy	"Programming in ANSI C	(7th Edn.), TMH	2017

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	ReemaThareja	Programming in C	(2nd Edn), Oxford University Press	2015
2	H. Schildt	"C: The Complete Reference"	(4th Edn), TMH	2000

Web References

https://www.geeksforgeeks.org/generations-of-computers-computer-fundamentals/

https://opentextbc.ca/computerstudies/chapter/classification-of-generations-of-computers/

https://www.tutorialspoint.com/cprogramming/index.htm

https://www.javatpoint.com/c-programming-language-tutorial

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:	23UAI102			**Title**	**Batch:**	2023 - 2026
				Core II: Data Structures and Applications	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	5		**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**: History of Algorithm- Definition, Structure and Properties of Algorithms-Development of an Algorithm- Data Structures and Algorithms-Data Structure – Definition and	12

	classification. **Analysis of Algorithms**: Efficiency of Algorithms-Apriori Analysis-Asymptotic Notations-Time Complexity of an Algorithm using O Notation-Polynomial vs Exponential Algorithms-Average, Best and Worst case Complexities-Analyzing Recursive Programs .	
Unit II	**Linear Data Structures**: **Arrays** - Introduction—Arrays Operations – Number of Elements in an Array-Representation of Arrays in Memory-Applications. **Stack**: Introduction-Operations of Stack-Applications. . **Queue**: Introduction-Operations of Queue -Circular Queues – other types of queues-Applications. **Linked List**: Introduction - Singly Linked Lists - Circularly Linked Lists - Doubly Linked Lists - Multiply Linked Lists –Applications.	13
Unit III	**Non Linear Data Structures: Trees**: Definition and Basic Terminologies -Representation of Trees - Binary Trees: Basic Terminologies and Types - Representation of Binary Trees - Binary Tree Traversals - Threaded Binary Trees – Application**. Graphs**: Introduction - Definitions and Basic Terminologies -Representations of Graphs - Graph Traversals - Applications.	12
Unit IV	**Sorting**: Introduction- Bubble Sort – insertion sort-Selection Sort – Merge Sort – shell Sort – Quick Sort – Heap Sort –Radix Sort	11
Unit V	**Searching**: Introduction -Linear Search – Transpose sequential search—Interpolation search-Binary Search – Fibonacci search-other search techniques.	12
	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	G AVijayalakshmi Pai	Data structures and Algorithms	McGraw Hill, 1st Edition, ISBN: 9780070667266	20008
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.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:	23UAI1A1			**Title**	**Batch:**	2023 - 2026
				General Elective I : Introduction to Linear Algebra	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	4		**Credits:**	4

Course Objective

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

Course Outcomes

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 x	2016

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	. Surjeetsingh, QaziZameeruddin,	Modern Algebra	Vikas Publishing House, 8 thedition	2006
2	Seymorelipsehutz	Beginning Linear Algebra	Tata Mcgraw hill,	2005.
3	S.G. Venkatachalapathy	Modern Algebra	Margham Publications	2008.
4	Ward ChenayDEwid Kincaid,	Linear Algebra Theory and Applications,		I edition 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: Mr.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:	23UDA2A1			**Title**	**Batch:**	2023 - 2026
				General Elective II: Discrete mathematics	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	4		**Credits:**	4

Course objectives

This course has been designed for students to learn and understand

- the logic and Proof
- basic concept of counting and graph
- apply the concept of counting Techniques

Course Outcome

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	K2
CO2	Demonstrate an understanding of relations ,functions, Combinations and lattices	K3
CO3	Apply the techniques of discrete structures and logical reasoning to solve a variety of problems and write an argument using logical notation	K4
CO4	Analyze and construct mathematical arguments that relate to the study of discrete structures	K5
CO5	Analyze and construct mathematical arguments that relate to the study of discrete structures	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	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	12
Unit 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.	12
Unit 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.	12
Unit 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.	12
Unit 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	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	Dr. M. K. Venkataraman, Dr. N. Sridharan, N. Chandarasekaran	Discrete Mathematics	The National Publishing Company Chennai	2006
2	S. Kumaravelu& SusheelaKumaravelu	Graph Theory	JankiCalender Corporation, Sivakasi,	1999
3	Kumaravelu and SuseelaKumaravelu	Elements of Number Theory	Raja Sankar offset Printers.	2002

Reference Books

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	McGraw Hill International Edition	2007
2	Dr. A. Singaravelu, Dr.V.Ravichandran, Dr. T.N. Shanmugam	Discrete Mathematics	Meenakshi agency 5th edition	2008
3	NarsinghDeo	Graph Theory with applications to engineering and computer science	, Prentice hall of India, New Delhi, 2	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.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:	23UAI103			**Title**	**Batch:**	2023 – 2026
				Core Lab I : Programming Lab in C	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	5	**Tutorial Hrs./Sem.**	5		**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
	Implement programs using I/O Statements. Create programs with C Operators. Develop C program using Conditional statements. Build C programs using Looping statements. Implement the Arrays, Stack and Queue in C. Write a C program using Functions. Implement the String handling functions in C. Experiments Pointers and storage classes in C.

	Implement C program using Structures. Programs using Unions. Create files using File handling operations in C. Write C program using Command line arguments. Implement the sorting and searching algorithms in C
	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:	23UAI204			**Title**	**Batch:**	2023 - 2026
				Core III: Programming in Java	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	5		**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	K2
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	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	Principles of object oriented programming: Software Evolution – Procedure Oriented Programming – Object-Oriented Programming Paradigm – Key Concepts of Object-Oriented Programming – Benefits of OOP – Object-Oriented Languages – Applications of OOP.	12
Unit II	Java Evolution-Overview of Java Language-Constants, Variables & Data types Operators & Expressions-Decision making & branching-Decision making & looping.	13
Unit III	Classes, Objects & methods- Arrays, Strings & Vectors-Interfaces: Multiple Inheritance – Packages: Putting classes together - Multithreaded Programming	12
Unit IV	**Packages**: Access Protection - Importing Packages - Interfaces - Exception Handling - Throw and Throws - Thread - Synchronization - Messaging - Runnable Interface - Inter thread Communication - Multithreading.	11
Unit V	**Managing Input/ Output in files in Java**: Introduction-Concept of Streams-Stream Classes-Byte Stream classes-Character Stream Classes-Using Streams-other useful I/O Classes- using the File Class-I/O Exceptions-Creation of Files-Reading/Writing Characters - Reading/Writing Bytes.	12
	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	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	TheJava 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**
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:	23UAI205			**Title**	**Batch:**	2023 - 2026
				Operating systems	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**			**Credits:**	4

Course Objectives

- This course has been designed for students to learn and understand The main components and their functions of Operating Systems
- The concept of process management, scheduling, IPC and Deadlocks.
- The need for special purpose operating systems

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Recognize the components of an OS and their functions.	K2
CO2	Understand the CPU process management policies.	K2
CO3	Apply the scheduling algorithms for CPU scheduling	K3
CO4	Analyze the various memory management policies	K4
CO5	Articulate the various Input and Output management policies	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 Operating Systems** : Introduction - history of operating system-processors - computer hardware - memory - disk - input and output devices - buses - different kinds of operating system – Operating system concepts - System calls-Operating system structure - monolithic - layered - microkernel - client/server models - virtual machines.	12
II	**Processes & Threads** : Processes -process model -process creation - process termination -process hierarchies - process states- threads - thread model and usage- classical thread model- inter process communication - race conditions - critical regions - mutual exclusion - semaphores	12
III	**Scheduling and Memory** Management : Introduction to scheduling - scheduling in batch systems - interactive systems -realtime systems - Memory Abstraction -notion of an address space -swapping - managing free space - Virtual Memory - Page replacement algorithms - design issues for paging systems - segmentation	12
IV	**Deadlocks** :Resources- introduction to deadlocks - conditions for deadlocks-deadlock modeling - deadlock detection and recovery - deadlocks avoidance - deadlock prevention. Multiple processor system: multiprocessors -hardware's - operating system types synchronization - scheduling - multi computers -distributed systems.	12
V	**I/O Management** : Principles of I/O hardware -I/O devices - device controllers -memory mapped I/O - DMA - principles of I/O software - goals of I/O software-programmed I/O - interrupt -driven I/O - Files systems: Files - directories - files systems implementation - File System Management and Optimization.	12
Total		**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	Andrew S. Tanenbaum	"Modern Operating Systems"	4th Edition, PHI New Delhi.	2015

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	William Stallings	"Operating Systems - Internals & Design Principles"	(9th Edition, PHI private Ltd, New Delhi	2018

2	Abraham Silberschatz, Greg Gagne, Peter B. Galvin	Operating Systems Concepts	10th Edition, John Wiley	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:	23UDA2A1			**Title**	**Batch:**	2023 - 2026
				General Elective I: Probability and Statistics	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	5		**Credits:**	4

Course Objective

This course has been designed for students to learn and understand

- Basic concepts of Probability theory
- Apply the concepts to solve the probability problems
- Concepts of Regression and Correlation

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Explain the concept of probability theory	K2
CO2	Identify the problem-solving random variable and probability function	K2
CO3	Apply the knowledge of Probability distribution	K3
CO4	Identify the sampling distributions	K3
CO5	Interpret the concept of correlation and regression	K3

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	**Probability:** Introduction- Sample spaces- Events- The probability of events-Some rules of probability- Conditional probability- Independent Events- Bayes theorem- The theory and practice.	12
Unit II	**Random Variable :** The expected value of a random variable –Moments –Chebyshev's theorem - Moment Generating Function-Product of moments- Moments of linear combinations of random variables- Conditional expectations- The theory and practice	11
Unit III	**Special Probability Distribution :** The Discrete uniform, Binomial, Poisson, Hyper Geometric, Geometric and Negative Binomial distributions. Special Probability Densities: Uniform, Normal, Exponential, Gamma, Beta and Bivariate normal distributions.	12
Unit IV	**Sampling Distribution:** The distribution of the mean – Finite populations- The chi-square distribution – The t distribution- The F distribution- Order Statistics- The theory and practice.	12
Unit V	**Regression and Correlation** : Introduction- Linear regression- The method of Least squares-Normal Regression Analysis- Normal Correlation Analysis- Multiple Linear regression- The theory and practice.	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	John E. Freund's	"Mathematical Statistics with Applications "	8th Edition, Prentice Hall of India, New Delhi	2018

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Robert. V. Hogg and Allen T.G. Craig	"Introduction to Mathematical Statistics",	5th edition, Pearson Education	2006
2	Suddhebdu Biswas and G.L. Sriwastav.	"Mathematical Statistics",	1st Edition, Narosa Publishing House Pvt. India.	2009
3	Nabebdu Pal and Sahadeb Sarkar	"Statistics	2nd Edition, Prentice Hall of India, New Delhi	2009
	Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying E. Ye,	"Probability and Statistics for Engineers and Scientists	:, 9th edition, Pearson Education	2006

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.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:	23UDA2A2			**Title**	**Batch:**	2023 - 2026
				General Elective II: Optimization Techniques	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	5		**Credits:**	4

Course Objectives

Mathematical Foundation course Solves

- Modeling linear programs and solving with a computer
- Simplex algorithms to solve linear programs
- Other algorithms for linear programming
- Integer Programming, 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	K2
CO2	To understand the Problems using various linear Algorithms	K3
CO3	To apply algorithms to the decision making problems	K4
CO4	To Analyse the programming algorithms with exercises	K5
CO5	To Summarize the inventory and queuing models	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	I**ntroduction**: Simplex method – Graphical method – Standard form – IBFS- Artificial Variable technique – big M	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	12
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) : (α/FIFO) , (M/M/1) : (N/FIFO) , (M/M/C) : (α / 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	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	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	. P.K. Gupta, D.S. Hira	Problem in Operations Research	S.Chand& Company Ltd	2007
2	J.K. Sharma	Operations Research Theory and Applications	Third Edition, Macmillan India Ltd	2006
3	Hamdy A. Taha	Operations Research : An Introduction	Eight Edition PHI, New Delhi,	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: Mr.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:	23UAI206			**Title**	**Batch:**	2023 - 2026
				Core Lab II Programming Lab in Java	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	5		**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

Content
Program to generate Fibonacci series Program to check if the number is prime or not Program to find the factorial of a number Program to emulate a Simple calculator Program to check if the string is a Palindrome or not Program to check if the year is a Leap Year Program to check if the number is an Armstrong number or not Program to demonstrate Multilevel Inheritance.

Program to demonstrate Method Overloading. Program to demonstrate Method Overriding. Dynamic Method dispatch. Program to demonstrate interfaces. Program to demonstrate packages. Program to demonstrate user-defined exception. Program to demonstrate Multi-threading concept. Applet program to demonstrate basic controls
Total Hours 60

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**
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:	22UAI2S1			**Title**	**Batch:**	2022 - 2025
				SEC I: Naan Mudhalvan : Industry 4.0	**Semester:**	I
Lecture Hrs./Week or Practical Hrs./Week	2	**Tutorial Hrs./Sem.**			**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.	6
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 .	6
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	6
Unit IV	Internet of Things (IoT) : Introduction to IoT - Architecture of IoT - Technologies for IoT - Developing IoT Applications - Applications of IoT - Security in IoT .	6
Unit V	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.	6
	Total Contact Hrs	**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	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. B.Azhagusundari Signature	Dr. S. Niraimathi Signature	Mr. K. Srinivasan Signature	Dr. R .ManicaChezian Signature