

**Progressive Education Society's
Modern College of Engineering
Department of Computer Engineering**



Curriculum Booklet

**Final Year
2019 Pattern
Semester-I**



Progressive Education Society's
Modern College of Engineering
Department of Computer Engineering



Progressive Education Society's
Modern College of Engineering, Shivajinagar, Pune-05.
Department of Computer Engineering

Curriculum Booklet

2019 – Pattern
Class: BE Computer
Engineering Semester: I



Vision of the Institute

"To create a collaborative academic environment to foster professional excellence and ethical values"

Mission of the Institute

- To develop outstanding professionals with high ethical standards capable of creating and managing global enterprises.
- To foster innovation and research by providing a stimulating learning environment.
- To ensure equitable development of students of all ability levels and backgrounds.
- To be responsive to changes in technology, socio-economic and environmental conditions.
- To foster and maintain mutually beneficial partnerships with alumni and industry.

Vision of the Department

- To achieve excellence in the field of computing through quality education.

Mission of the Department

- To develop promising professionals in the field of computing.
- To provide exposure to emerging technologies and inculcate ethics.
- To strengthen association with alumni and industry.



Objectives of the Institute

- To develop infrastructure appropriate for delivering quality education
- To develop the overall personality of students who will be innovators and future leaders capable of prospering in their work environment.
- To inculcate ethical standards and make students aware of their social responsibilities.
- Promote close interaction among industry, faculty and students to enrich the learning process and enhance career opportunities.
- Encourage faculty in continuous professional growth through quality enhancement programs and research and development activities.
- Foster a healthy work environment which allows for freedom of expression and protection of the rights of all stakeholders through open channels of communication

Program Educational Objectives

The graduates of Computer Engineering Department will be,

PEO1: Capable of solving real world problems.

PEO2: Capable of working with multidisciplinary projects.

PEO3: Capable to adapt to changing technologies and life management skills.

PEO4: Able to exhibit professional and ethical responsibilities.

Program Specific Outcomes

Graduate of computer engineering program will demonstrate

- The ability to understand, analyze, develop and evaluate system based on various algorithmic approaches.
- The ability to pursue career in IT industries, to become an entrepreneur and have zest for higher studies.
- The ability to solve problems using engineering principles, tools and techniques.



Program Outcomes

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. 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.



Progressive Education Society's
Modern College of Engineering
Department of Computer Engineering

Departmental Academic Planner: Student Activities

Year: 2022-2023 Editable

Semester: I



Modern College Of Engineering, Pune-05.
DEPARTMENT OF COMPUTER ENGINEERING

Departmental Academic Calendar
Student Activities

Year: 2022-2023

Term: I

Sr. No.	Day & Date	Activity
1.	14/07/2022 Thursday	• Timetable Display (TE-BE)
2.	18/07/2022 Monday	• Term-I commencement (TE-BE).
3.	18/07/2022-30/07/2022 Monday	• Student registration (TE-BE). • HOD's address
4.	11/08/2022 Tuesday	• Timetable Display (SE)
5.	15/08/2022 Monday	• Independence Day Celebration
6.	17/08/2022 Wednesday	• Term-I commencement (SE)
7.	17/08/22 - 31/08/2022 Wednesday To Wednesday	• Student registration (SE).
8.	18/08/2022 Thursday	• Review of first month attendance (TE-BE). • Counseling by GFM & HOD.
9.	22/08/2022 To 27/08/2022 Monday To Saturday	• Assessment-1 (TE -BE) Unit #1 ,2
10.	17/09/2022 Saturday	• Review of first month attendance (TE-BE).
11.	17/09/2022 Saturday	• Parent Meet
12.	19-24/09/2022 Saturday	• Part Submission (TE-BE) • Assessment-1(SE) Unit #1 .2
13.	26/09-01/10/2022 Thursday	• Assessment-2 (TE -BE) Unit #3.4 • Review of second month attendance (SE-BE) • Counseling by GFM & HOD.
14.	07/10/2022 Monday To Friday	• Display Submission schedule (TE-BE).
15.	10/10/2022 - 15/10/2022 Monday- To Saturday	• Assessment-3 (TE -BE) Unit #5,6
16.	17/10/2022 Wednesday	• Review of third month attendance (TE-BE) (Final)
17.	17/10/2022 - 21/10/2022 Monday- Friday	• Assessment-2(SE) Unit #3,4



Note: - Individual staff can take more assessment test as per their assessment tool planner.
- SPPU Examination will be scheduled as per SPPU notification.

(Prof. Dr. Mrs. S.A. Itkar)
HOD
Department of Computer Engineering

Course Structure

Faculty of Engineering

Savitribai Phule Pune University



BE Computer Engineering 2019 Course tentative Curriculum structure:

Savitribai Phule Pune University Fourth Year of Computer Engineering (2019 Course) (With effect from Academic Year 2022-23)														
Semester VII														
Course Code	Course Name	Teaching Scheme (Hours/week)			Examination Scheme and Marks						Credit Scheme			
		Lecture	Practical	Tutorial	Mid-Sem	End-Sem	Term work	Practical	Oral/Pre	Total	Lecture	Practical	Tutorial	Total
410241	Design and Analysis of Algorithms	03	-	-	30	70	-	-	-	100	3	-	-	3
410242	Machine Learning	03	-	-	30	70	-	-	-	100	3	-	-	3
410243	Blockchain Technology	03	-	-	30	70	-	-	-	100	3	-	-	3
410244	Elective III	03	-	-	30	70	-	-	-	100	3	-	-	3
410245	Elective IV	03	-	-	30	70	-	-	-	100	3	-	-	3
410246	Laboratory Practice III	-	04	-	-	-	50	50	-	100	-	2	-	2
410247	Laboratory Practice IV	-	02	-	-	-	50	-	-	50	-	1	-	1
410248	Project Stage I	-	02	-	-	-	50	-	-	50	-	2	-	2
Total Credit											15	05	-	20
Total		15	08	-	150	350	150	50	-	700	15	05	-	20
410249	Audit Course 7										Grade			
Elective III						Elective IV								
410244(A) Pervasive Computing 410244(B) Multimedia Techniques 410244(C) Cyber Security and Digital Forensics 410244(D) Object Oriented Modeling and Design 410244(E) Digital Signal Processing						410245(A) Information Retrieval 410245(B) GPU Programming and Architecture 410245(C) Mobile Computing 410245(D) Software Testing and Quality Assurance 410245(E) Compilers								
Laboratory Practice III: Laboratory assignments Courses- 410241, 410242, 410243						Laboratory Practice IV: Laboratory assignments Courses- 410244, 410245								
Audit Course 7(AC7) Options: AC7- I MOOC- Learn New Skills AC7- II Entrepreneurship Development AC7- III Botnet of Things AC7- IV 3D Printing AC7- V Industrial Safety and Environment Consciousness														



1. Subject – Design and Analysis of Algorithm

Name of the Course – Design and Analysis of Algorithms (410241)

1.1. Course Structure

Weekly Workload (In Hrs.)	Lecture	Tutorial	Practical
	3 Hrs./week	-	-

Mid-Sem	End-Sem	Practical	Oral	Term-work	Total Marks	Credit
30	70	-	-	-	100	3

1.2. Prerequisite courses

- Discrete Mathematics,
- Fundamentals of Data Structures,
- Data Structures and Algorithms,
- Theory of Computation

1.3. Course Objective

- To develop problem solving abilities using mathematical theories.
- To apply algorithmic strategies while solving problems.
- To analyse performance of different algorithmic strategies in terms of time and space.
- To develop time and space efficient algorithms.
- To study algorithmic examples in distributed and concurrent environments
- To Understand Multithreaded and Distributed Algorithms

1.4. Course Outcome

On completion of the course, student will be able to–

CO1: Formulate the problem

CO2: Analyse the asymptotic performance of algorithms

CO3: Decide and **apply** algorithmic strategies to solve given problem

CO4: Find optimal solution by applying various methods

CO5: Analyse and **Apply** Scheduling and Sorting Algorithms.

CO6: Solve problems for multi-core or distributed or concurrent environments



1.5. Syllabus

<u>Unit No.</u>	<u>Course Contents</u>	<u>Hours</u>
I	Algorithms and Problem Solving	07
	Algorithm: The Role of Algorithms in Computing - What are algorithms, Algorithms as technology, Evolution of Algorithms, Design of Algorithm, Need of Correctness of Algorithm, Confirming correctness of Algorithm – sample examples, Iterative algorithm design issues. Problem solving Principles: Classification of problem, problem solving strategies, classification of time complexities (linear, logarithmic etc.)	
II	Analysis of Algorithms and Complexity Theory	07
	Analysis: Input size, best case, worst case, average case, Counting Dominant operators, Growth rate, upper bounds, asymptotic growth, O , Ω , Θ , o and ω notations, polynomial and non-polynomial problems, deterministic and non-deterministic algorithms, P- class problems, NP-class of problems, Polynomial problem reduction NP complete problems- vertex cover and 3-SAT and NP hard problem - Hamiltonian cycle.	
III	Greedy And Dynamic Programming Algorithmic Strategies	08
	Greedy strategy: Principle, control abstraction, time analysis of control abstraction, knapsack problem, scheduling algorithms-Job scheduling and activity selection problem. Dynamic Programming: Principle, control abstraction, time analysis of control abstraction, binomial coefficients, OBST, 0/1 knapsack, Chain Matrix multiplication.	
IV	Backtracking and Branch-n-Bound	08
	Backtracking: Principle, control abstraction, time analysis of control abstraction, 8-queen problem, graph colouring problem, sum of subsets problem. Branch-n-Bound: Principle, control abstraction, time analysis of control abstraction, strategies- FIFO, LIFO and LC approaches, TSP, knapsack problem.	
V	Amortized Analysis	07
	Amortized Analysis: Aggregate Analysis, Accounting Method, Potential Function method, Amortized analysis-binary counter, stack Time-Space trade-off, Introduction to Tractable and Non-tractable Problems, Introduction to Randomized and Approximate algorithms, Embedded Algorithms: Embedded system scheduling (power optimized scheduling algorithm), sorting algorithm for embedded systems.	
VI	Multithreaded And Distributed Algorithms	07
	Multithreaded Algorithms - Introduction, Performance measures, Analysing multithreaded algorithms, Parallel loops, Race conditions. Problem Solving using Multithreaded Algorithms - Multithreaded matrix multiplication, Multithreaded merge sort. Distributed Algorithms - Introduction, Distributed breadth first search, Distributed Minimum Spanning Tree. String Matching- Introduction, The Naive string-matching algorithm, The Rabin-Karp algorithm.	



1.6. Textbooks:

Sr. No.	Textbooks
T1	Parag Himanshu Dave, Himanshu Bhalchandra Dave, —Design And Analysis of Algorithms , Pearson Education, ISBN 81-7758-595-9
T2	Gilles Brassard, Paul Bratley, —Fundamentals of Algorithmics , PHI, ISBN 978-81-203-1131-2

1.7. Reference Books:

Sr. No.	Reference Books
R1	Michael T. Goodrich, Roberto Tamassia, —Algorithm Design: Foundations, Analysis and Internet Examples , Wiley, ISBN 978-81-265-0986-7
R2	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, —Introduction to Algorithms , MIT Press; ISBN 978-0-262-03384-8
R3	Horowitz and Sahani, "Fundamentals of Computer Algorithms", University Press, ISBN: 978 81 7371 6126, 81 7371 61262
R4	Rajeev Motwani and Prabhakar Raghavan, —Randomized Algorithms Cambridge University Press, ISBN: 978-0-521-61390-3
R5	Dan Gusfield, —Algorithms on Strings, Trees and Sequences , Cambridge University Press, ISBN:0- 521-67035-7
R6	Gerard Tel- Introduction to Distributes Algorithms, 2 nd Ed. CAMBRIDGE ::: UNIVERSITY PRESS, ISBN 0 521 79483 8

1.8. Reference Web Links/ Research Paper

Sr. No.	Web Links/ Research Paper Link
L1	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/design_and_analysis_of_algorithms_tutorial.pdf
L2	https://www.ebooks.com/en-in/book/1679384/algorithms-design-techniques-and-analysis/m-h-alsuwaiyel
L3	https://nptel.ac.in/courses/106106131
L4	https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/



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1.9. Teaching Plan

Unit No.	Broad Topic to be covered	Books Referred	Total Lectures Planned
I	Algorithms and Problem Solving	T1, T2, R2	7
II	Analysis of Algorithms and Complexity Theory	T2	7
III	Greedy And Dynamic Programming Algorithmic Strategies	T1, T2, R2, R3	8
IV	Backtracking and Branch-n-Bound	T1, R3	8
V	Amortized Analysis	T1, R2	7
VI	Multithreaded And Distributed Algorithms	R2, R6	7

1.10. Schedule of Assessment Tools

Sr. No.	CO No.	Unit No.	Assessment Tool	Marks	Schedule
1	C401.1	I	Test No.1	20	First week of March 2021
2	C401.2	II	Test No.2	20	First week of April 2021
3	C401.3	I, III, IV, V	Assignment No. 1	20	Fourth week of April 2021
4	C401.4	III, IV	Assignment No. 4	20	Second week of May 2021
5	C401.5	V	Open Book Test No. 1	20	Third week of May 2021
6	C401.6	VI	MCQ Test No. 1	20	Fourth week of May 2021
Total Marks				180	



1.11. Unit wise Lecture Plan

Unit I - Algorithms and Problem Solving

Objectives: -

- To develop problem solving abilities using mathematical theories.
- To apply algorithmic strategies while solving problems.

Outcomes: - Students will be able to,

- Formulate the problem
- Decide and apply algorithmic strategies to solve given problem.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	The Role of Algorithms in Computing - What are algorithms, Algorithms as technology	R2-CH1	Board and PPT
2	Evolution of Algorithms	T1-CH1	Board and PPT
3	Design of Algorithm, Need of Correctness of Algorithm, Confirming correctness of Algorithm sample examples	T1- CH2, T2- CH1, CH5, CH6	Board and PPT, Problem Solving
4	Iterative algorithm design issues	T1-CH4	Board and PPT
5	Problem solving Principles: Classification of problem	T1-CH2	Board and PPT
6	problem solving strategies	T1-CH2	Board and PPT
7	classification of time complexities (linear, logarithmic etc.)	T1-CH14	Board and PPT

Unit II - Analysis of Algorithms and Complexity Theory

Objectives: -

1. To analyse performance of different algorithmic strategies in terms of time and space.

Outcomes: - Students will be able to,

1. Analyse the asymptotic performance of algorithms

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Analysis: Input size, best case, worst case, average case	T2-CH2	Board and PPT, Problem Solving
2	Counting Dominant operators, Growth rate, upper bounds, asymptotic growth, O, notations	T2-CH3	Board and PPT
3	polynomial, and non-polynomial problems	T2-Ch12	Board and PPT
4	deterministic and non-deterministic algorithms,	T1-CH17	Board and PPT
5	P- class problems, NP-class of problems, Polynomial problem reduction	T1-CH17	Board and PPT
6	NP complete problems- vertex cover and 3-SAT	T1-CH18	Board and PPT
7	NP hard problem - Hamiltonian cycle	T1-CH18	Board and PPT



Unit III - Greedy and Dynamic Programming Algorithmic Strategies

Objectives: -

1. To apply algorithmic strategies while solving problems.
2. To develop time and space efficient algorithms.

Outcomes: - Students will be able to,

1. Decide and apply algorithmic strategies to solve given problem
2. Find optimal solution by applying various methods

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Greedy strategy: Principle, control abstraction, time analysis of control abstraction	T1-CH10	Board and PPT
2	Knapsack problem	T1-CH10, R3-CH4	Board and PPT
3	scheduling algorithms-Job scheduling	T2-CH10	Board and PPT
4	scheduling algorithms -activity selection problem	T2-CH10	Board and PPT
5	Dynamic Programming: Principle, control abstraction, time analysis of control abstraction,	T2-CH11	Board and PPT
6	binomial coefficients	T2-CH11	Board and PPT
7	OBST, 0/1 knapsack	T2-CH5, R2-CH15, R3-CH5	Board and PPT
8	Chain Matrix multiplication.	T2-CH5, R2-CH15	Board and PPT

Unit IV - Backtracking and Branch-n-Bound

Objectives: -

1. To apply algorithmic strategies while solving problems.
2. To develop time and space efficient algorithms.

Outcomes: - Students will be able to,

1. Decide and apply algorithmic strategies to solve given problem
2. Find optimal solution by applying various methods

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Backtracking: Principle, control abstraction, time analysis of control abstraction	T1-CH12, R3-CH7	Board and PPT
2	8-queen problem	T1-CH12, R3-CH7	Board and PPT
3	graph colouring problem	T1-CH12, R3-CH7	Board and PPT
4	sum of subsets problem	T1-CH12, R3-CH7	Board and PPT
5	Branch-n-Bound: Principle, control abstraction, time analysis of control abstraction strategies	R3-CH8	Board and PPT
6	FIFO, LIFO, and LC approaches	R3-CH8	Board and PPT
7	TSP	R3-CH8	Board and PPT
8	knapsack problem	R3-CH8	Board and PPT



Unit V - Amortized Analysis

Objectives: -

1. To apply algorithmic strategies while solving problems.
2. To develop time and space efficient algorithms.

Outcomes: - Students will be able to,

1. Decide and apply algorithmic strategies to solve given problem
2. Analyse and Apply Scheduling and Sorting Algorithms.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Amortized Analysis: Aggregate Analysis, Accounting Method	R2-CH17	Board and PPT
2	Accounting Method, Potential Function method,	R2-CH17	Board and PPT
3	Amortized analysis-binary counter, stack Time-Space trade-off,	R2-CH17	Board and PPT
4	Introduction to Tractable and Nontrackable Problems,	T1-CH17	Board and PPT
5	Introduction to Randomized and Approximate algorithms,	T1-CH19	Board and PPT
6	Embedded Algorithms: Embedded system scheduling (power optimized scheduling algorithm)	Links	Board and PPT
7	Sorting algorithm for embedded systems.	Links	Board and PPT

Unit VI - Multithreaded and Distributed Algorithms

Objectives: -

1. To study algorithmic examples in distributed and concurrent environments
2. To Understand Multithreaded and Distributed Algorithms

Outcomes: - Students will be able to,

1. Solve problems for multi-core or distributed or concurrent environments

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Multithreaded Algorithms - Introduction, Performance measures, Analysing multithreaded algorithms, Parallel loops, Race conditions.	R2-Ch27	Board and PPT
2	Problem Solving using Multithreaded Algorithms - Multithreaded matrix multiplication,	R2-Ch27	Board and PPT
3	Multithreaded merge sort.	R2-Ch27	Board and PPT
4	Distributed Algorithms - Introduction, Distributed breadth first search,	R6 -ch 1, 12.4	Board and PPT
5	Distributed Minimum Spanning Tree	R6 -ch 7.3.2	Board and PPT
6	String Matching- Introduction, The Naive string-matching algorithm	R2-Ch32	Board and PPT
7	The Rabin-Karp algorithm	R2-Ch32	Board and PPT



1.12. Unit wise Question Bank

Unit I - Algorithms and Problem Solving

Sr. No	Question
1.	Explain different characteristics of algorithm
2.	Why correctness of algorithm is essential
3.	Explain iterative algorithm design issues
4.	Explain different means of improving efficiency of algorithm
5.	Write short note on Algorithm as a technology
6.	Write short note on evolution of algorithm
7.	What are the general rules followed while writing algorithm
8.	How to confirm correctness of algorithm, explain with example
9.	Explain the concept of PMI and prove the correctness of an algorithm to find factorial of a number using PMI
10.	Contrast and compare between iterative and recursive process with example
11.	Explain the importance of algorithm in computing with example
12.	Explain various algorithm design methodology to solve a problem
13.	Explain Big O, Omega and Theta notations. Explain what they are used for
14.	How do we analyze algorithms, explain what is space and time complexity.
15.	Discuss different ways of algorithm design with suitable example

Unit II - Analysis of Algorithms and Complexity Theory

Sr. No	Question
1	Prove that vertex cover problem is NP-complete
2	Differentiate between a) Deterministic and non-deterministic algorithms b) P class and NP class problem c) Polynomial and non-deterministic polynomial
3	Show that Hamiltonian problem is NP-hard
4	Explain NP and NP-hard problems
5	What is satisfiability problem
6	What is SAT and 3-SAT problem? Prove that 3-SAT problem is NP complete
7	Define P, NP, NP-hard, NP-complete
8	State and explain NP-hard for Hamiltonian cycle and Vertex Cover problem
9	What is NP complete problem? Explain steps to prove that problem is NP-complete



10	Explain vertex cover problem with example
11	Explain polynomial reduction problem
12	Define Asymptotic Notations. Explain their significance in analyzing algorithms.
13	Explain deterministic and non-deterministic algorithms
14	Explain class NP-hard. Differentiate between NP-hard & NP-complete algorithms.
15	Define Big O, Omega and Theta Notation
16	State whether the following functions are CORRECT or INCORRECT and justify your answer. i) $3n+2=O(n)$ ii) $100n+6=O(n)$ iii) $10n^2+4n+2=O(n^2)$
17	What are best case, worst case and average case time complexity?

Unit III - Greedy and Dynamic Programming Algorithmic Strategies

Sr. No	Question															
1	Give linear time algorithm for fractional knapsack problem.															
2	Differentiate between $O(1)$ and $O(n)$. Does algorithm performance depend on input size? Justify your answer with an example.															
3	What are the applications of greedy strategy? Explain the concept of optimal solution.															
4	Explain the concept of scheduling algorithm. Calculate the total profit for the following problem using Greedy approach Tasks given (T_1, \dots, T_9) . Deadline $(7, 2, 5, 3, 4, 5, 2, 7, 3)$ and profit $(15, 20, 30, 18, 18, 10, 23, 16, 25)$ respectively.															
5	Using Greedy approach for the instances of Knapsack of item $n=3$, & capacity $m=20$ and having profit $(P_1, P_2, P_3)=(25, 24, 15)$ & weight $(W_1, W_2, W_3)=(18, 15, 10)$ Find out the optimal solution.															
6	Greedy approach- Consider the following instances of knapsack problem $n=5$, $w=100$, $W(10, 20, 30, 40, 50)$, $V(20, 30, 66, 40, 60)$ Find the optimal solution.															
7	Explain the knapsack problem using mathematical notations. Solve the above Knapsack problem using Greedy approach to get optimal solution with maximum profit items given $(i_1, i_2, i_3, i_4, i_5)$ Profit $(10, 20, 5, 7, 8)$ Weight $(5, 6, 7, 8, 10)$, Max weight = 15.															
8	Find the correct sequence for jobs using following instances. <table style="margin-left: 20px;"> <thead> <tr> <th>JobID</th> <th>Deadline</th> <th>Profit</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>4</td> <td>20</td> </tr> <tr> <td>2</td> <td>1</td> <td>10</td> </tr> <tr> <td>3</td> <td>1</td> <td>40</td> </tr> <tr> <td>4</td> <td>1</td> <td>30</td> </tr> </tbody> </table>	JobID	Deadline	Profit	1	4	20	2	1	10	3	1	40	4	1	30
JobID	Deadline	Profit														
1	4	20														
2	1	10														
3	1	40														
4	1	30														



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9	Explain the control abstraction in Dynamic Programming. What is the use of memorization table?
10	Find an optimal solution for following 0/1 Knapsack problem using dynamic programming., Number of objects $n=4$, Knapsack capacity $M=5$, Weights $(w_1, w_2, w_3, w_4) = (2, 3, 4, 5)$ & Profit $(p_1, p_2, p_3, p_4) = (3, 4, 5, 6)$
11	Solve 0/1 Knapsack problem. Consider $N=3$, $(w_1, w_2, w_3) = (2, 3, 3)$, $(p_1, p_2, p_3) = (1, 2, 4)$ and $M=6$.
12	Consider the chain matrix A_1, A_2 and A_3 with dimensions given below. Give the optimal parentheses to get the product. Matrix Dimensions A_1 5X10 A_2 10X20 A_3 20X25
13	Why the greedy strategy cannot be used to solve 0/1 knapsack problem?
14	What is general strategy for greedy algorithm?
15	Explain greedy method using control abstraction.
16	What is the difference between feasible solution and optimal solution
17	What are the characteristics of greedy method?
18	What is meant by overlapping substructure with respect to dynamic programming?
19	Explain activity selection problem using greedy method
20	Explain chained matrix multiplication method using dynamic programming
21	Explain binomial coefficient with Pseudocode
22	Solve Binomial coefficient for $C[4,2]$

Unit IV - Backtracking and Branch-n-Bound

Sr. No	Question
1	Explain in detail state space tree
2	Explain backtracking solution to 0/1 knapsack problem
3	Analyze 8 queens problem using backtracking
4	Explain how branch and bound method can be used to solve knapsack problem.
5	Explain in detail control abstraction for LC-search
6	What is the difference between backtracking and branch and bound method?
7	What are the different strategies for branch and bound? Explain FIFO.
8	Explain graph coloring problem using backtracking.
9	Explain how to solve travelling salesman problem using branch and bound
10	Compare LC, FIFO and LIFO method and justify the best one.



Unit V - Amortized Analysis

Sr. No	Question
1	What is amortized analysis? List different methods to do the same
2	Explain amortized analysis of Binary heap, Binomial heap and Fibonacci heap
3	Discuss aggregate method for amortized analysis
4	Discuss amortized analysis operations on stack and counter
5	Perform aggregate time complexity analysis for implementing K-bit binary counter
6	Discuss the accounting method for amortized analysis and the operations on stack and counter.
7	Discuss the potential method for amortized analysis and the operations on stack and counter.
8	Explain binary heap algorithm with its complexity analysis
9	Explain Dijkstra's algorithm with its complexity
10	Write a short note on time-space trade-off
11	Write short note on randomized algorithms
12	Write and explain sorting algorithm for embedded systems and state its time complexity.
13	What is embedded system? Explain embedded system scheduling algorithms
14	Write a short note on splay trees

Unit VI - Multithreaded and Distributed Algorithms

Sr. No	Question
1	Explain multithreaded Algorithms.
2	Analyze multithreaded algorithm with suitable example.
3	Write a note on dynamic multithreading
4	Explain the performance measures: work, span, speedup, parallelism and slackness
5	What is the concept of parallel loops
6	What are race conditions in multithreaded algorithms?
7	Write and explain the algorithm for multithreaded matrix multiplication
8	Write and explain the algorithm for multithreaded merge sort
9	What are distributed algorithms?
10	Explain distributed breadth first search algorithm for 1D partitioning
11	Explain distributed breadth first search algorithm for 2D partitioning
12	What is string matching? Explain with example.
13	Write a detailed note on Rabin Karp String matching algorithm and discuss its complexity



2. Name of the Course – Machine Learning (410242)

2.1 Course Structure

Weekly Workload (In Hrs)	Lecture	Tutorial	Practical
	3 Hrs/week	-	-

Midsem	Endsem	Practical	Oral	Term-work	Total Marks	Credit
30	70	-	-	-	100	3

Prerequisite courses

Data Science and Big Data Analytics

2.2 Course Objective

1. To understand the need for Machine learning
2. To explore various data pre-processing methods.
3. To study and understand classification methods
4. To understand the need for multi-class classifiers.
5. To learn the working of clustering algorithms
6. To learn fundamental neural network algorithms.

2.3 Course Outcome

On completion of the course, student will be able to–

CO1: Identify the needs and challenges of machine learning and apply various data pre-processing techniques to simplify and speed up machine learning algorithms.

CO2: Select and apply appropriately supervised machine learning algorithms for real world applications and measure its performance.

CO3: Compare and contrast different clustering algorithms.

CO4: Design a neural network for solving engineering problems.



2.4 Syllabus

Unit No.	<u>Course Contents</u>	<u>Hours</u>
I	Introduction To Machine Learning	07
	Introduction to Machine Learning, Comparison of Machine learning with traditional programming, ML vs AI vs Data Science. Types of learning: Supervised, Unsupervised, and semi-supervised, reinforcement learning techniques, Models of Machine learning: Geometric model, Probabilistic Models, Logical Models, Grouping and grading models, Parametric and non-parametric models. Important Elements of Machine Learning- Data formats, Learnability, Statistical learning approaches	
II	Feature Engineering	07
	Concept of Feature, Preprocessing of data: Normalization and Scaling, Standardization, Managing missing values, Introduction to Dimensionality Reduction, Principal Component Analysis (PCA), Feature Extraction: Kernel PCA, Local Binary Pattern. Introduction to various Feature Selection Techniques, Sequential Forward Selection, Sequential Backward Selection. Statistical feature engineering: count-based, Length, Mean, Median, Mode etc. based feature vectorcreation. Multidimensional Scaling, Matrix Factorization Techniques	
III	Supervised Learning : Regression	06
	Bias, Variance, Generalization, Underfitting, Overfitting, Linear regression, Regression: Lasso regression, Ridge regression, Gradient descent algorithm. Evaluation Metrics: MAE, RMSE, R2	
IV	Supervised Learning : Classification	08
	Classification: K-nearest neighbour, Support vector machine. Ensemble Learning: Bagging, Boosting, Random Forest, Adaboost. Binary-vs-Multiclass Classification, Balanced and Imbalanced Multiclass Classification Problems, Variants of Multiclass Classification: One-vs-One and One-vs-All Evaluation Metrics and Score: Accuracy, Precision, Recall, Fscore, Cross-validation, MicroAverage Precision and Recall, Micro-Average F-score, Macro-Average Precision and Recall, Macro-Average F-score.	
V	Unsupervised Learning	07
	K-Means, K-medoids, Hierarchical, and Density-based Clustering, Spectral Clustering. Outlier analysis: introduction of isolation factor, local outlier factor. Evaluation metrics and score: elbow method, extrinsic and intrinsic methods	
VI	Introduction To Neural Networks	07
	Artificial Neural Networks: Single Layer Neural Network, Multilayer Perceptron, Back Propagation Learning, Functional Link Artificial Neural Network, and Radial Basis Function Network, Activation functions, Introduction to Recurrent Neural Networks and Convolutional Neural Networks	



2.5 Textbooks:

Sr. No.	Textbooks
T1	Bishop, Christopher M., and Nasser M. Nasrabadi, —Pattern recognition and machine learning, Vol. 4.No. 4. New York: springer, 2006.
T2	Ethem Alpaydin, — Introduction to Machine Learning, PHI 2nd Edition-2013

2.6 Reference Books:

Sr. No.	Reference books
R1	Tom Mitchell, — Machine learning, McGraw-Hill series in Computer Science, 1997
R2	Shalev-Shwartz, Shai, and Shai Ben-David, —Understanding machine learning: From theory to algorithms, Cambridge university press, 2014.
R3	Jiawei Han, Micheline Kamber, and Jian Pei, —Data Mining: Concepts and Techniques, Elsevier Publishers Third Edition, ISBN: 9780123814791, 9780123814807
R4	Hastie, Trevor, et al., —The elements of statistical learning: data mining, inference, and prediction, Vol. 2. New York: springer, 2009.
R5	McKinney, —Python for Data Analysis —, O' Reilly media, ISBN : 978-1-449-31979-3
R6	Trenton, —Scikit-learn, Cookbook, Packt Publishing, ISBN: 9781787286382
R7	Goodfellow I., Bengio Y. and Courville, — A Deep Learning, MIT Press, 2016

2.7 Reference Web Links/ Research Paper/ Referred Book

Introduction to Machine Learning : https://nptel.ac.in/courses/106105152 _
Introduction to Machine Learning (IIT Madras): https://onlinecourses.nptel.ac.in/noc22_cs29/preview
Deep learning: https://nptel.ac.in/courses/106106184

2.8 Teaching Plan

Unit No.	Broad Topic to be covered	Books Referred	Total Lectures Planned
I	Introduction To Machine Learning	T1, T2, R2	7
II	Feature Engineering	T1, T2, R2, R5	7
III	Supervised Learning : Regression	T1, T2, R2, R5	6
IV	Supervised Learning : Classification	T1, T2, R2, R5, R6	8
V	Unsupervised Learning	T1, T2, R2, R5	7
VI	Introduction To Neural Networks	T1, T2, R4,	7

2.9 Schedule of Assessment Tools

Sr. No.	CO No.	Unit No.	Assessment Tool	Marks	Schedule
1	C402.1	I & II	Test-1	20	Third week of Aug. 2022
2	C402.2	III & IV	Test-2	20	Second week of Sep. 2022
4	C402.3	V	Open Book Test	20	Fourth week of Sep. 2022
6	C402.4	VI	MCQ	20	Third week of Oct. 2021
Total Marks				80	



2.10 Unit wise Lecture Plan

Unit I - Introduction to Machine Learning

Objectives: -

- To understand the need for Machine learning

Outcomes: - Students will be able to,

- **Identify** the needs and challenges of machine learning and apply various data pre-processing techniques to simplify and speed up machine learning algorithms.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Introduction to Machine Learning, Comparison of Machine learning with traditional programming,	T2	Board and PPT
2	ML vs AI vs Data Science	T2	Board and PPT
3	Types of learning: Supervised, Unsupervised, and semi-supervised, reinforcement learning techniques	T2	Board and PPT
4	Models of Machine learning: Geometric model, Probabilistic Models	T2	Board and PPT
5	Logical Models, Grouping and grading models, Parametric and non-parametric models.	T2	Board and PPT
6	Important Elements of Machine Learning- Data formats, Learnability	T2	Board and PPT
7	Statistical learning approaches	T2	Board and PPT

Unit II - Feature Engineering

Objectives: -

- To explore various data pre-processing methods.

Outcomes: - Students will be able to,

- **Identify** the needs and challenges of machine learning and apply various data pre-processing techniques to simplify and speed up machine learning algorithms.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Concept of Feature, Preprocessing of data: Normalization and Scaling, Standardization	T2	Board and PPT
2	Managing missing values, Introduction to Dimensionality Reduction	T2	Board and PPT, Problem Solving
3	Principal Component Analysis (PCA)	T2	Board and PPT, Problem Solving
4	Feature Extraction: Kernel PCA, Local Binary Pattern.	T2	Board and PPT, Problem Solving
5	Introduction to various Feature Selection Techniques, Sequential Forward Selection, Sequential Backward Selection	T2, R2	Board and PPT, Problem Solving



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6	Statistical feature engineering: count-based, Length, Mean, Median, Mode etc. based feature vector creation.	T2, R2	Board and PPT, Problem Solving
7	Multidimensional Scaling, Matrix Factorization Techniques	T2, R2	Board and PPT, Problem Solving

Unit III - Supervised Learning: Regression

Objectives: -

- To study and understand classification methods

Outcomes: - Students will be able to,

- **Select and apply** appropriately supervised machine learning algorithms for real world applications and measure its performance.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Bias, Variance, Generalization	T2	Board and PPT, Problem Solving
2	Underfitting, Overfitting, Linear regression	T2	Board and PPT, Problem Solving
3	Regression: Lasso regression	T2	Board and PPT, Problem Solving
4	Ridge regression, Gradient descent algorithm.	T2	Board and PPT, Problem Solving
5	Evaluation Metrics: MAE	T2, R2	Board and PPT, Problem Solving
6	RMSE, R2	T2, R2	Board and PPT, Problem Solving

Unit IV - Supervised Learning: Classification

Objectives: -

- To understand the need for multi-class classifiers.

Outcomes: - Students will be able to,

- **Select and apply** appropriately supervised machine learning algorithms for real world applications and measure its performance.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Classification: K-nearest neighbour, Support vector machine.	T2	Board and PPT, Problem Solving
2	Ensemble Learning: Bagging, Boosting, Random Forest, Adaboost	T2	Board and PPT, Problem Solving
3	Binary-vs-Multiclass Classification	T2	Board and PPT, Problem Solving
4	Balanced and Imbalanced Multiclass Classification Problems	T2	Board and PPT, Problem Solving
5	Variants of Multiclass Classification: One-vs-One and One-vs-All	T2, R2	Board and PPT, Problem Solving
6	Evaluation Metrics and Score: Accuracy, Precision, Recall, Fscore,	T2, R2	Board and PPT, Problem Solving



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7	Cross-validation, Micro-Average Precision and Recall, Micro-Average F-score,	T2	Board and PPT, Problem Solving
8	Macro-Average Precision and Recall, Macro-Average F-score.	T2	Board and PPT, Problem Solving

Unit V - Unsupervised Learning

Objectives: -

- To learn the working of clustering algorithms

Outcomes: - Students will be able to,

- **Compare and contrast** different clustering algorithms.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	K-Means, K-medoids,	T2	Board and PPT, Problem Solving
2	Hierarchical, and Density-based Clustering	T2	Board and PPT, Problem Solving
3	Spectral Clustering	T2	Board and PPT, Problem Solving
4	Outlier analysis: introduction of isolation factor,	T2	Board and PPT, Problem Solving
5	Local outlier factor.	T2, R2	Board and PPT, Problem Solving
6	Evaluation metrics and score: elbow method	T2, R2	Board and PPT, Problem Solving
7	extrinsic and intrinsic methods	T2	Board and PPT, Problem Solving

Unit VI - Introduction To Neural Networks

Objectives: -

- To learn fundamental neural network algorithms.

Outcomes: - Students will be able to,

- **Design** a neural network for solving engineering problems.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Artificial Neural Networks: Single Layer Neural Network,	T2	Board and PPT, Problem Solving
2	Multilayer Perceptron, Back Propagation Learning	T2	Board and PPT, Problem Solving
3	Functional Link Artificial Neural Network	T2	Board and PPT, Problem Solving
4	Radial Basis Function Network,	T2	Board and PPT, Problem Solving
5	Activation functions	T2, R4	Board and PPT, Problem Solving
6	Introduction to Recurrent Neural Networks	T2, R4	Board and PPT, Problem Solving
7	Convolutional Neural Networks	T2	Board and PPT, Problem Solving



2.11 Unit wise Question Bank

Unit I - Introduction to Machine Learning

Sr. No	Question	Marks	CO	BL	PI	PO
1	What does Machine learning exactly mean? Explain Application of Machine Learning for data scientists.	5	C402. 1	L3	1.3.1	PO1
2	Explain Supervised Learning with the help of an Example?	5	C402. 1	L3	1.3.1	PO1, PO2
3	Difference between ML, AI and DS?	5	C402. 1	L2	1.3.1	PO1
4	Explain Unsupervised Learning and type of unsupervised learning with advantages and disadvantages?	5	C402. 1	L3	1.3.1	PO1
5	Difference between Supervised Learning, Unsupervised Learning, and Reinforcement Learning?	5	C402. 1	L2	1.3.1	PO1
6	Explain Reinforcement Learning with the help of an Example?	5	C402. 1	L3	1.3.1	PO1, PO2
7	Explain data format for Supervised Learning problem with Example?	5	C402. 1	L3	1.3.1	PO1
8	Explain Different model of ML?	5	C402. 1	L3	1.3.1	PO1
9	Explain the technique classification and regression with reference to supervised learning.	5	C402. 1	L3	1.3.1	PO1
10	Difference between Parametric and non-parametric models?	5	C402. 1	L3	1.3.1	PO1

Unit II - Feature Engineering

Sr. No	Question	Marks	CO	BL	PI	PO
1	Differentiate with an example label encoder and one hot encoder for managing categorical data.	5	C402. 1	L2	1.3.1	PO1
2	How Ridge Regression help for regularizing linear models? Write Scikit-Learn Code for Ridge Regression?	5	C402. 1	L5	1.3.1	PO1
3	Write a short note on Sparse PCA, Kernel PCA?	5	C402. 1	L2	1.3.1	PO1
4	What do u mean by Principle Component Analysis(PCA). Expalain non negative matrix factorization method?	5	C402. 1	L5	2.1.3	PO2
5	Explain the Concept of scalling and normalization with its types?	5	C402. 1	L5	1.3.1	PO1
6	Explain how kernel PCA and Local Binary Pattern help in Dimensionality reduction?	5	C402. 1	L5	1.3.1 2.1.3	PO1, PO2
7	What is Feature Selection? Explain different feature selection algorithm?	5	C402. 1	L2	1.3.1	PO1
8	Explain Different Statistical Measures in feature engineering with suitable example?	5	C402. 1	L5	1.3.1	PO1
9	Write a short note on: Multidimensional Scaling and matrix factorization?	5	C402. 1	L2	1.3.1	PO1



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Unit III - Supervised Learning: Regression

Sr. No	Question	Marks	CO	BL	PI	PO																												
1	What do you mean by Logistic Regression? Explain with example.	5	C402. 2	L2	1.1.1	PO1																												
2	How Ridge Regression help for regularizing linear models? Write Scikit-Learn Code for Ridge Regression?	5	C402. 2	L2	1.3.1	PO1																												
3	What is Overfitting and Underfitting in ML model? Explain with Example?	5	C402. 2	L5	1.1.1	PO1																												
4	What do u mean by Logistic Regression? Explain with Example?	5	C402. 2	L5	2.2.3	PO2																												
5	Following table Show the misterm and final exam grade obtained for students in a database course. Use the method of least seuares using regression to predict the final exam grade of a student who received 86 in the mid term exam. <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>X</td> <td>72</td> <td>50</td> <td>81</td> <td>74</td> <td>94</td> <td>86</td> <td>59</td> <td>83</td> <td>86</td> <td>33</td> <td>88</td> <td>81</td> </tr> <tr> <td>Y</td> <td>84</td> <td>53</td> <td>77</td> <td>78</td> <td>90</td> <td>75</td> <td>49</td> <td>79</td> <td>77</td> <td>52</td> <td>74</td> <td>90</td> </tr> </table>	X	72	50	81	74	94	86	59	83	86	33	88	81	Y	84	53	77	78	90	75	49	79	77	52	74	90	5	C402. 2	L3	1.3.1	PO1		
X	72	50	81	74	94	86	59	83	86	33	88	81																						
Y	84	53	77	78	90	75	49	79	77	52	74	90																						
6	Explain lasso regression in detail?	5	C402. 2	L5	1.1.1	PO1																												
7	Given the following data for the sales of car of an automobile company for six consecutive year. Predict the sale for next two consecutive year? <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>Year</td> <td>2013</td> <td>2014</td> <td>2015</td> <td>2016</td> <td>2017</td> <td>2018</td> </tr> <tr> <td>X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Sales</td> <td>110</td> <td>100</td> <td>250</td> <td>275</td> <td>230</td> <td>300</td> </tr> <tr> <td>Y</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Year	2013	2014	2015	2016	2017	2018	X							Sales	110	100	250	275	230	300	Y							5	C402. 2	L3	2.2.4	PO2
Year	2013	2014	2015	2016	2017	2018																												
X																																		
Sales	110	100	250	275	230	300																												
Y																																		
8	Write a short note on- 1. Gradient Descent Algorithm 2. MAE 3. RMSE 4. R2?	5	C402. 2	L5	1.3.1	PO1																												



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Unit IV - Supervised Learning: Classification

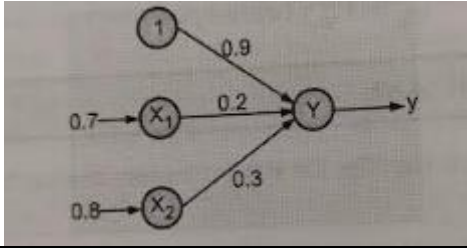
Sr. No	Question	Marks	CO	BL	PI	PO																								
1	Consider the following data set consisting of the score of two variables on each of seven individuals apply k-means clustering to cluster this data into 2 clusters <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Sub.</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>1.0</td> <td>1.5</td> <td>3.0</td> <td>5.0</td> <td>3.5</td> <td>4.5</td> <td>3.5</td> </tr> <tr> <td>B</td> <td>1.0</td> <td>2.0</td> <td>4.0</td> <td>7.0</td> <td>5.0</td> <td>5.0</td> <td>4.5</td> </tr> </tbody> </table>	Sub.	1	2	3	4	5	6	7	A	1.0	1.5	3.0	5.0	3.5	4.5	3.5	B	1.0	2.0	4.0	7.0	5.0	5.0	4.5	5	C402. 2	L3	2.2.4	PO2
Sub.	1	2	3	4	5	6	7																							
A	1.0	1.5	3.0	5.0	3.5	4.5	3.5																							
B	1.0	2.0	4.0	7.0	5.0	5.0	4.5																							
2	Write a Short note on 1. Bagging 2. Boosting 3. Random Forests	5	C402. 2	L2	1.1.1	PO1																								
3	Explain KNN algorithm? What is need of KNN?	5	C402. 2	L5	1.3.1	PO1																								
4	Difference between linear SVM and non linear SVM?	5	C402. 2	L2	2.2.3	PO2																								
5	Explain SVM with following terms: Separating hyperplane, margin and support vector with example?	5	C402. 2	L5	1.3.1	PO1																								
6	Difference between Decision Tree and Random Forest?	5	C402. 2	L2	1.1.1	PO1																								
7	Explain Classification Matrices?	5	C402. 2	L5	1.3.1	PO1																								
8	Explain Cross Validation in ML?	5	C402. 2	L5	1.3.1	PO1																								
9	Difference between Precision and Recall?	5	C402. 2	L2	1.1.1	PO1																								

Unit V - Unsupervised Learning

Sr. No	Question	Marks	CO	BL	PI	PO
1	Explain Clustering in unsupervised learning?	5	C402. 3	L5	1.1.1	PO1
2	Describe the essential step of K-Means algorithm for clustering analysis?	5	C402. 3	L5	1.3.1	PO1
3	Explain the concept of K-medoids and hierarchical clustering?	5	C402. 3	L2	7.1.2	PO3
4	Write a notes on machine learning application?	5	C402. 3	L2	2.2.3	PO2
5	Explain graph based clustering and its algorithm?	5	C402. 3	L5	3.3.1	PO3
6	Write a note on outlier analysis and isolation factor?	5	C402. 3	L2	1.1.1	PO1
7	Explain different evaluation metrics and score?	5	C402. 3	L5	1.3.1	PO1
8	Explain compare extrinsic and intrinsic method?	5	C402. 3	L2	1.3.1	PO1
9	Given {2,4,10,12,3,20,30,11,25} Assume number of clusters i.e. K= 2?	5	C402. 3	L3	2.3.1	PO3

10	Apply k means algorithm on given data for $k = 3$. Use $c_1(2)$, $c_2(16)$, $c_3(38)$ as initial cluster centres. Data: 2,4,6,3,31,12,15,16,38,35,14,21,23,25,30	5	C402. 3	L3	3.3.1	PO3																					
11	For a given set of point identify cluster using complete link and average link using agglomerative clustering <table border="1" style="margin-left: 20px;"> <tr> <td></td> <td>P1</td> <td>P2</td> <td>P3</td> <td>P4</td> <td>P5</td> <td>P6</td> </tr> <tr> <td>A</td> <td>1</td> <td>1.5</td> <td>5</td> <td>3</td> <td>4</td> <td>3</td> </tr> <tr> <td>B</td> <td>1</td> <td>1.5</td> <td>5</td> <td>4</td> <td>4</td> <td>3.5</td> </tr> </table>		P1	P2	P3	P4	P5	P6	A	1	1.5	5	3	4	3	B	1	1.5	5	4	4	3.5	5	C402. 3	L3	3.3.1	PO3
	P1	P2	P3	P4	P5	P6																					
A	1	1.5	5	3	4	3																					
B	1	1.5	5	4	4	3.5																					
12	Difference between K means and DBSCAN?	5	C402. 3	L2	1.1.1	PO1																					

Unit VI - Introduction to Neural Networks

Sr. No	Question	Marks	CO	BL	PI	PO
1	Calculate the output of the neuron y for the net given below use binary and bipolar sigmoidal activation functions? 	5	C402. 4	L3	2.2.3	PO2
2	Explain Common activation function used in Neural Network? With mathematical list four different function used in neurons?	5	C402. 4	L5	1.1.1	PO1
3	Write a short note on Convolutional Network and RNN?	5	C402. 4	L2	1.3.1	PO1
4	Explain CNN architecture?	5	C402. 4	L5	3.3.1	PO3
5	Explain pooling layers and its different types?	5	C402. 4	L5	1.1.1	PO1
6	Explain Padding with its type??	5	C402. 4	L2	1.1.1	PO1



3. Name of the Course – Block chain Technology (410243)

3.1 Course Structure

Weekly Workload (In Hrs)	Lecture	Tutorial	Practical
	3 Hrs/week	-	-

Midsem	Endsem	Practical	Oral	Term-work	Total Marks	Credit
30	70	-	-	-	100	3

3.2 Prerequisite courses

Computer Networks and Security

3.3 Course Objective

1. Technology behind Blockchain
2. Crypto currency, Bitcoin and Smart contracts
3. Different consensus algorithms used in Blockchain
4. Real-world applications of Blockchain
5. To analyze Blockchain Ethereum Platform using Solidity
6. To Describe Blockchain Case Studies

3.4 Course Outcome

On completion of the course, student will be able to–

CO1: Interpret the fundamentals and basic concepts in Blockchain

CO2: Compare the working of different blockchain platforms

CO3: Use Crypto wallet for cryptocurrency based transactions

CO4: Analyze the importance of blockchain in finding the solution to the real-world problems

CO5: Illustrate the Ethereum public block chain platform

CO6: Identify relative application where block chain technology can be effectively used and implemented.



3.5 Syllabus

Unit No.	<u>Course Contents</u>	<u>Hours</u>
I	<u>Mathematical Foundation for Blockchain</u>	06
	Cryptography: Symmetric Key Cryptography and Asymmetric Key Cryptography, Elliptic Curve Cryptography (ECC), Cryptographic Hash Functions: SHA256, Digital Signature Algorithm (DSA), Merkel Trees.	
II	<u>Feature Engineering</u>	07
	History, Centralized Vs. Decentralized Systems, Layers of Blockchain: Application Layer, Execution Layer, Semantic Layer, Propagation Layer, Consensus Layer, Why is Block chain important? Limitations of Centralized Systems, Blockchain Adoption So Far.:	
III	<u>Blockchain Platforms and Consensus in Blockchain</u>	06
	Types of Blockchain Platforms: Public, Private and Consortium, Bitcoin, Ethereum, Hyperledger, IoT, Corda, R3. Consensus in Blockchain: Consensus Approach, Consensus Elements, Consensus Algorithms, Proof of Work, Byzantine General problem, Proof of Stake, Proof of Elapsed Time, Proof of Activity, Proof of Burn.	
IV	<u>Cryptocurrency – Bitcoin, and Token</u>	06
	Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics Types of Cryptocurrency, Cryptocurrency Usage, Cryptowallets: Metamask, Coinbase, Binance.	
V	<u>Blockchain Ethereum Platform using Solidity</u>	06
	What is Ethereum, Types of Ethereum Networks, EVM (Ethereum Virtual Machine), Introduction to smart contracts, Purpose and types of Smart Contracts, Implementing and deploying smart contracts using Solidity, Swarm (Decentralized Storage Platform), Whisper (Decentralized Messaging Platform)	
VI	<u>Blockchain Case Studies</u>	06
	Prominent Blockchain Applications, Retail, Banking and Financial Services, Government Sector, Healthcare, IOT, Energy and Utilities, Blockchain Integration with other Domains	

3.6 Textbooks:

Sr. No.	Textbooks
T1	Martin Quest , -Blockchain Dynamics: A Quick Beginner's Guide on Understanding the Foundations of Bit coin and Other Crypto currencies, Create Space Independent PublishingPlatform, 15-May-2018
T2	Imran Bashir, -Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained, Second Edition, Packt Publishing, 2018
T3	Alex Leverington, -Ethereum Programming, Packt Publishing, 2017

3.7 Reference Books:

Sr. No.	Reference books
R1	Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda, "Beginning Blockchain ABeginner's Guide to Building Blockchain Solutions",2018
R2	Chris Dannen, "Introducing Ethereum and Solidity", Foundations of Crypto currency andBlockchain Programming for Beginners
R3	Daniel Drescher, "Blockchain Basics", A Non -Technical Introduction in 25Steps.
R4	Ritesh Modi, -Solidity Programming Essentials, Packt Publishing,2018
R5	Chandramouli Subramanian, Asha A George, Abhilash K A and Meena Karthikeyan, -Blockchain Technology, Universities Press, ISBN-9789389211634

3.8 Reference Web Links/ Research Paper/ Referred Book

1. https://users.cs.fiu.edu/~prabakar/cen5079/Common/textbooks/Mastering_Blockchain_2nd_Edition.pdf
2. https://www.lopp.net/pdf/princeton_bitcoin_book.pdf
3. https://www.blockchainexpert.uk/book/blockchain-book.pdf

3.9 Teaching Plan

Unit No.	Broad Topic to be covered	Books Referred	Total Lectures Planned
I	Mathematical Foundation for Blockchain	T1, R1, R3	6
II	Feature Engineering	T1, T2,R5	7
III	Blockchain Platforms and Consensus in Blockchain	T1,T3,R3	6
IV	Cryptocurrency – Bitcoin, and Token	T1, R2	6
V	Blockchain Ethereum Platform using Solidity	T2, T3, R4	6
VI	Blockchain Case Studies	T1, R3,R5	6

3.10 Schedule of Assessment Tools

Sr. No.	CO No.	Unit No.	Assessment Tool	Marks	Schedule
1	C414.1	I, II	Test-1	20	Fourth week of August 2022
2	C414.2,3	III, IV	Test-2	20	Second week of September 2022
3	C414.4	V	Skill Test-1	20	Third week of Oct 2022
4	C414.5,6	VI	Test-3	20	Fourth week of Oct 2022
Total Marks				80	



3.11 Unit wise Lecture Plan

Unit I - Mathematical Foundation for Blockchain

Objectives: -

1. To learn and understand basic concepts of cryptography, hash functions

Outcomes: - Students will be able to,

- Discuss and compare the Symmetric & Asymmetric cryptography.
- Analyze SHA-256, Digital Signature mechanisms.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Cryptography: Symmetric Key Cryptography	T1,	Board and PPT
2	Asymmetric Key Cryptography	T1	Board and PPT
3	Elliptic Curve Cryptography (ECC)	T1	Board and PPT
4	Cryptographic Hash Functions: SHA256	T1	Board and PPT
5	Digital Signature Algorithm (DSA)	T1, R1	Board and PPT
6	Merkel Trees	R3	Board and PPT

Unit II - Feature Engineering

Objectives: -

1. Technology behind Blockchain
2. Interpret the fundamentals and basic concepts in Blockchain
3. Layers of block chain

Outcomes: - Students will be able to,

1. Analyze the importance of blockchain.
2. Working of different layers of blockchain

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	History	T1	Discussion
2	Centralized Vs. Decentralized Systems	T2	Board and PPT
3	Layers of Blockchain: Application Layer, Execution Layer, Semantic Layer	T1	Board and PPT
4	Propagation Layer, Consensus Layer	T1	Board and PPT
5	Why is Block chain important?	T2, R5	Board and PPT
6	Limitations of Centralized Systems	T2	Board and PPT
7	Blockchain Adoption So Far.	R5	Board and PPT



Unit III - Blockchain Platforms and Consensus in Blockchain

Objectives: -

1. Interpret the types of block chain
2. To analyze Blockchain Bitcoin , Ethereum Platform using Solidity
3. Different consensus algorithms used in Blockchain

Outcomes: - Students will be able to,

1. Illustrate the Ethereum public block chain platform
2. Implement PoW, PoS

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Types of Blockchain Platforms: Public, Private and Consortium	T1,R3	Board and PPT
2	Bitcoin, Ethereum, Hyperledger,IoTA, Corda, R3	T3,R3	Board and PPT
3	Consensus in Blockchain: Consensus Approach, Consensus Elements,	T1	Board and PPT
4	Consensus Algorithms,	T1	Board and video
5	Proof of Work, Byzantine General problem	T1, R3	Board and PPT
6	Proof of Stake, Proof of Elapsed Time, Proof of Activity,	R3	Video & explanation
7	Proof of Burn	T1,R3	Board and PPT

Unit IV - Cryptocurrency – Bitcoin, and Token

Objectives: -

1. To analyze type of cryptocurrency
2. Interpret the usage of crypto wallet using Metamask

Outcomes: - Students will be able to,

1. Use Crypto wallet for cryptocurrency based transactions
2. Analyze the importance of blockchain in finding the solution to the real-world problems.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Introduction, Bitcoin, Cryptocurrency,	T1	Board and PPT
2	Cryptocurrency Basics	T1	Board and PPT
3	Types of Cryptocurrency	T1,R2	Discussion
4	Cryptocurrency Usage	T2	Board and PPT
5	Cryptowallets: Metamask	T1, R2	Installation Process on internet
6	Coinbase	R2	Board and PPT
7	Binance	R2	Board and PPT



Unit V - Blockchain Ethereum Platform using Solidity

Objectives: -

1. Different types of Ethereum Networks used in Blockchain
2. Use of smart contracts

Outcomes: - Students will be able to,

1. Illustrate the Ethereum public block chain platform.
2. Implementing and deploying Decentralized platforms

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	What is Ethereum, Types of Ethereum Networks	T3	Chalk & Board
2	EVM (Ethereum Virtual Machine), Introduction to smart contracts,	T3	Board and PPT
3	Purpose and types of Smart Contracts	T2	PPT
4	Implementing and deploying smart contracts using Solidity	T2,R4	Software deploying
5	Swarm (Decentralized Storage Platform),	T2, T3	Board and PPT
6	Whisper (Decentralized Messaging Platform)	T2, T3,R4	Board and PPT

Unit VI - Blockchain Case Studies

Objectives: -

1. Use of Blockchain applications in different sectors
2. Real-world applications of Blockchain

Outcomes: - Students will be able to,

1. Identify relative application where block chain technology can be effectively used and implemented.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Prominent Blockchain Applications	T1	Group Discussion
2	Retail, Banking and Financial Services	T1,R3	Board and PPT
3	Government Sector,	T1, R5	Board and PPT
4	Healthcare ,IOT,	T3	Board and PPT
5	Energy and Utilities	T1, R5	Board and PPT
6	Blockchain Integration with other Domains	R3, R5	Board and PPT



3.12 Unit wise Question Bank

Unit I - Mathematical Foundation for Blockchain

Sr. No	Question	Marks	CO	BL	PI	PO
1	Compare Symmetric Key and Asymmetric Key	5	C401. 1	L2	1.3.1	PO1
2	Explain impact of Hash Function on SHA-256 system performance	5	C401. 1	L2	2.1.1	PO2
3	Define term Digital Signature and elaborate its use in block chain.	5	C401. 1	L1	3.1.1	PO3
4	Explain the methods for Cryptography	5	C401. 1	L2	2.2.3	PO2
5	Outline ECC architecture with schematic diagram.	5	C401. 1	L2	3.2.2	PO3
6	Interpret Cryptographic Hash Functions	5	C401. 1	L2	5.2.1	PO5
7	Identify how to manage Merkel Trees	5	C401. 1	L1	4.1.1	PO4
8	Justify any five applications Digital Signature.	5	C401. 1	L2	5.3.2	PO5

Unit II - Feature Engineering

Sr. No	Question	Marks	CO	BL	PI	PO
1	State the basic concepts of blockchain	5	C401. 1	L1	1.3.1	PO1
2	List several differences between a public and a private blockchain.	5	C401. 1	L2	2.2.4	PO2
3	What Are the Benefits of Blockchain?	5	C401. 1	L1	7.1.2	PO7
4	Compare Centralized Vs. Decentralized Systems	5	C401. 1	L2	2.2.4	PO2
5	Draw & Layers of Blockchain	5	C401. 1	L2	2.2.2	PO2
6	Describe the concept of a block and its components.	5	C401. 1	L3	2.2.2	PO2
7	Give Limitations of centralized system in block chain	5	C401. 1	L1	2.4.4	PO2
8	Describe five core components of blockchain technology.	5	C401. 1	L3	2.2.2	PO2



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Unit III - Blockchain Platforms and Consensus in Blockchain

Sr. No	Question	Marks	CO	BL	PI	PO
1	How Does Proof-Of-Work (Pow) Consensus Algorithm Work?	5	C401.2	L3	4.1.1	PO4
2	How Does Proof-Of-Stake (Pos) Consensus Algorithm Work?	5	C401.2	L3	4.1.1	PO4
3	Define the three major characteristics of money that bitcoin possesses	5	C401.2	L1	2.1.3	PO2
4	Demonstrate and Interpret working of Hyperledger Fabric	5	C401.2	L3	2.4.4	PO2
5	Name the common type of ledgers that can be considered by users in Blockchain	5	C401.2	L2	5.2.1	PO5
6	Define a cryptographic token. Explain the difference between fungible and nonfungible tokens and identify the appropriate Ethereum token standards for each	5	C401.2	L2	2.1.3	PO2
7	A distributed digital ledger is used for recording transaction in BlockChain. What does the system rely on?	5	C401.2	L2	4.3.2	PO4
8	Proof of Work (PoW) consensus protocols have been criticized due to their high and continuously increasing mining cost. Discuss how mining cost affects the tamper resistance attribute of public blockchains	5	C401.2	L3	5.3.1	PO5

Unit IV - Cryptocurrency – Bitcoin, and Token

Sr. No	Question	Marks	CO	BL	PI	PO
1	What are cryptocurrencies? in detail.	5	C401.3	L2	2.1.1	PO2
2	Beyond a method for payment, what are other functions of cryptocurrencies?	5	C401.3	L5	3.4.2	PO3
3	What is the benefit of blockchain wallet?	5	C401.3	L1	7.1.1	PO7
4	What blockchain does Coinbase use? Does Coinbase accept blockchain?	5	C401.3	L2	4.3.4	PO4
5	Which cryptocurrency is mainly used in MetaMask?	5	C401.3	L1	5.1.1	PO5
6	Explain in detail usage of Cryptocurrency	5	C401.3	L2	2.2.2	PO2
7	Is Coinbase the same as blockchain Wallet?	5	C401.3	L3	4.3.1	PO4
8	What do you mean by Double Spending?	5	C401.3	L3	4.1.1	PO4



Unit V - Blockchain Ethereum Platform using Solidity

Sr. No	Question	Marks	CO	BL	PI	PO
1	What is the very first thing you must specify in a Solidity file?	5	C401.4	L1	1.2.1	PO1
2	Where do nodes run a smart contract code?	5	C401.4	L2	3.1.6	PO3
3	List and explain the parts of EVM memory.	5	C401.4	L2	2.2.1	PO2
4	What happens if the execution of a smart contract costs more than the specified gas?	5	C401.4	L5	11.1.1	PO11
5	Why is decentralization good in blockchain ecosystem? What are swarm robots used for?	5	C401.4	L2	4.3.1	PO4
6	What are the different types of smart contracts?	5	C401.4	L2	4.3.2	PO4
7	How to Implement and deploy smart contracts using Solidity	5	C401.4	L3	5.1.2	PO5
8	How Decentralized Messaging with Whisper Works in Ethereum	5	C401.4	L5	4.3.2	PO4

Unit VI - Blockchain Case Studies

Sr. No	Question	Marks	CO	BL	PI	PO
1	What are applications in block chain explain in detail.	5	C401.5,6	L2	2.4.4	PO2
2	Name some popular platforms for developing block chain applications	5	C401.5,6	L5	3.2.1	PO3
3	Explain how block chain is used in banking & financial sector	5	C401.5,6	L2	2.2.1	PO2
4	How does blockchain affect Health sector?	5	C401.5,6	L5	7.1.2	PO7
5	How does blockchain work in energy?	5	C401.5,6	L2	7.2.2	PO7
6	Which type of blockchain is concentrated for government sector?	5	C401.5,6	L2	6.1.1	PO6
7	How blockchain can ensure security in IoT domain?	5	C401.5,6	L3	6.2.1	PO6
8	In changing retails, how does suppliers and retailers earn consumer loyalty	5	C401.5,6	L3	9.2.3	PO9



4. Name of the Course – Cyber Security and Digital Forensic (410244C)

4.1 Course Structure

Weekly Workload (In Hrs)	Lecture	Tutorial	Practical
	3 Hrs/week	-	-

Midsem	Endsem	Practical	Oral	Term-work	Total Marks	Credit
30	70	-	-	-	100	3

Prerequisite courses

Computer Networks and Security (310244), Information Security(310254(A))

4.2 Course Objective

- To enhance awareness cyber forensics.
- To understand issues in cyber crime and different attacks
- To understand underlying principles and many of the techniques associated with the digital forensic practices
- To know the process and methods of evidence collection
- To analyze and validate forensic data collected.
- To apply digital forensic knowledge to use computer forensic tools and investigation report writing

4.3 Course Outcome

On completion of the course, student will be able to–

CO1: Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.

CO2: Build appropriate security solutions against cyber-attacks.

CO3: Underline the need of digital forensic and role of digital evidences.

CO4: Explain rules and types of evidence collection

CO5: Analyze, validate and process crime scenes

CO6: Identify the methods to generate legal evidence and supporting investigation reports.



4.4 Syllabus

Unit No.	<u>Course Contents</u>	<u>Hours</u>
I	Introduction to Cyber Security	06
	Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: crime against an individual, Crime against property, Cyber extortion, Drug trafficking, cyber terrorism. Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.	
II	Cyber Crime Issues and Cyber attacks	06
	Unauthorized Access to Computers, Computer Intrusions, Viruses, and Malicious Code, Internet Hacking and Cracking, Virus and worms, Software Piracy, Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet, Cybercrime prevention methods, Application security (Database, E-mail, and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Hardware protection mechanisms, OS Security.	
III	Introduction to Digital Forensics	06
	What is Computer Forensics?, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement — Computer Forensic Technology, Types of Business Computer Forensic Technology Computer Forensics Evidence and Capture: Data Recovery Defined, Data Back-up and Recovery, The Role of Back-up in Data Recovery, The Data-Recovery Solution.	
IV	Evidence Collection and Data Seizure	06
	Why Collect Evidence? Collection Options ,Obstacles, Types of Evidence — The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene — Computer Evidence Processing Steps, Legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image Verification and Authentication: Special Needs of Evidential Authentication, Practical Consideration, Practical Implementation.	
V	Computer Forensics analysis and validation	06
	Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, and performing remote acquisitions Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project. Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement	41



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	crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case	
VI	Current Computer Forensic tools	06
	Evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools	

4.5 Textbooks:

Sr. No.	Textbooks
T1	John R. Vacca, —Computer Forensics, Computer Crime Investigation Firewall Media, New Delhi
T2	Nelson, Phillips Einfinger, Steuart, —Computer Forensics and Investigations, CENGAGE Learning

4.6 Reference Books:

Sr. No.	Reference books
R1	Keith J. Jones, Richard Bejtich, Curtis W. Rose, —Real Digital Forensics, AddisonWesley Pearson Education
R2	Tony Sammes and Brian Jenkinson, —Forensic Compiling, A Tractitioneris Guide, Springer International edition.
R3	Christopher L.T. Brown, —Computer Evidence Collection & Presentation, Firewall Media
R4	Jesus Mena, —Homeland Security, Techniques & Technologies, Firewall Media

4.7 Reference Web Links/ Research Paper/ Referred Book

https://www.pdfdrive.com/computer-forensics-investigating-network-intrusions-and-cyber-crime-e15858265.html
https://dokumen.pub/handbook-of-computer-crime-investigation-forensic-tools-and-technology-1stnbsped-0121631036-9780121631031.html
Massachusetts Institute of Technology Open Courseware: https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-858-computer-systems-security-fall-2014/
MOOC Courses link:- MIT Open CourseWare:- https://ocw.mit.edu/courses/

4.8 Teaching Plan

Unit No.	Broad Topic to be covered	Books Referred	Total Lectures Planned
I	Introduction to Cyber Security	T1, T2, R1,R2	6
II	Cyber Crime Issues and Cyber attacks	T1, T2, R1,R4	6
III	Introduction to Digital Forensics	T1, T2, R1,R3	6
IV	Evidence Collection and Data Seizure	T1, T2, R2,R3	6
V	Computer Forensics analysis and validation	T1, T2, R2	6
VI	Current Computer Forensic tools	T1, T2, R1,R4	6

4.9 Schedule of Assessment Tools

Sr. No.	CO No.	Unit No.	Assessment Tool	Marks	Schedule
1	410244.1	Unit 1	Test 1	20	4 th week of August 2022
2	410244.2	Unit 2	Test 2	20	4 th week of September 2022
3	410244.3	Unit 3	Assignment 3	20	1 st week of November 2022
4	410244.4	Unit 4	Assignment 4	20	2 th week of November 2022
5	410244.5	Unit 5	Test 3(Open Book Test)	20	3 rd week of November 2022
6	410244.6	Unit 6	MCQ Test	20	3 rd week of November 2022
Total Marks				120	

4.10 Unit wise Lecture Plan

Unit I - Introduction to Cyber Security

Objective: -

- To enhance awareness cyber forensics.

Outcomes: - Students will be able to,

- Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime	T1,R1	Board and PPT
2	Types of Cyber Crime: crime against an individual	T1,R1	Board and PPT
3	Crime against property	T2,R2	Board and PPT
4	Cyber extortion, Drug trafficking, cyber terrorism	T2	Board and PPT
5	Need for Information security, Threats to Information Systems	T1,R2	Board and PPT
6	Information Assurance, Cyber Security, and Security Risk Analysis.	T1	Board and PPT

Unit II - Cyber Crime Issues and Cyber attacks

Objectives: -

- To understand issues in cyber crime and different attacks.

Outcomes: - Students will be able to,

- Build appropriate security solutions against cyber-attacks.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Unauthorized Access to Computers, Computer Intrusions, Viruses, and Malicious Code.	T2,R1	Board and PPT
2	Internet Hacking and Cracking, Virus and worms, Software Piracy.	T1,R1	Board and PPT
3	Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet	T2,R4	Board and PPT
4	Cybercrime prevention methods, Application security (Database, E-mail, and Internet)	T1,T2	Board and PPT
5	Security Technology-Firewall and VPNs	T2,R4	Board and PPT
6	Hardware protection mechanisms, OS Security	T1,T2	Board and PPT

Unit III - Introduction to Digital Forensics

Objectives: -

- To understand underlying principles and many of the techniques associated with the digital forensic practices

Outcomes: - Students will be able to,

- Underline the need of digital forensic and role of digital evidences.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	What is Computer Forensics?, Use of Computer Forensics in Law Enforcement	T1,T2,R1	Board and PPT
2	Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology	T1,T2,R1	Board and PPT
3	Steps taken by Computer Forensics Specialists Types of Computer Forensics Technology: Types of Military Computer Forensic Technology	T1,T2,R3	Board and PPT
4	Types of Law Enforcement — Computer Forensic Technology	T1,T2	Board and PPT
5	Types of Business Computer Forensic Technology Computer Forensics Evidence and Capture: Data Recovery Defined	T1,T2,R3	Board and PPT
6	Data Back-up and Recovery, The Role of Back-up in Data Recovery, The Data-Recovery Solution	T1,T2	Board and PPT

Unit IV - Evidence Collection and Data Seizure

Objectives: -

- To know the process and methods of evidence collection.

Outcomes: - Students will be able to,

- Explain rules and types of evidence collection.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Why Collect Evidence? Collection Options ,Obstacles, Types of Evidence — The Rules of Evidence, Volatile Evidence.	T1,T2,R3	Board and PPT
2	General Procedure, Collection and Archiving Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody Duplication	T1,T2,R2	Board and PPT
3	Preservation of Digital Evidence: Preserving the Digital Crime Scene	T1,T2,R3	Board and PPT
4	Computer Evidence Processing Steps, Legal Aspects of Collecting and Preserving Computer Forensic Evidence.	T1,T2,R3	Board and PPT
5	Computer Image Verification and Authentication, Special Needs of Evidential Authentication	T1,T2,R3	Board and PPT
6	Practical Consideration, Practical Implementation.	T1,T2,R2	Board and PPT



Unit V - Computer Forensics analysis and validation

Objectives: - To analyze and validate forensic data collected.

Outcomes: - Students will be able to,

- Analyze, validate and process crime scenes.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, and performing remote acquisitions	T1,T2	Board and PPT
2	Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics	T1,T2	Board and PPT
3	Network tools, examining the honeynet project, Processing Crime and Incident Scenes: Identifying digital evidence.	T1,T2,R2	Board and PPT
4	Collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search	T1,T2	Board and PPT
5	Securing a computer incident or crime scene, seizing digital evidence at the scene	T1,T2	Board and PPT
6	Storing digital evidence, obtaining a digital hash, reviewing a case	T1,T2	Board and PPT

Unit VI - Current Computer Forensic tools

Objectives: -

- To apply digital forensic knowledge to use computer forensic tools and investigation report writing.

Outcomes: - Students will be able to,

- Identify the methods to generate legal evidence and supporting investigation reports.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Evaluating computer forensic tool needs, computer forensics software tools.	T1,R1	Board and PPT
2	Computer forensics hardware tools, validating and testing forensics software E-Mail Investigations	T1,T2,R1	Board and PPT
3	Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail	T1,T2,R4	Board and PPT
4	Investigating e-mail crimes and violations	T1,T2,R1	Board and PPT
5	Understanding e-mail servers	T1,T2	Board and PPT
6	Using specialized e-mail forensic tools	R4	Board and PPT



4.11 Unit wise Question Bank

UNIT I - Introduction to Cyber Security

- Q1] Define Cyber Security? Discuss different types of cybercrimes?
- Q2] Discuss on drug trafficking in cyber security?
- Q3] Explain crime against property?
- Q4] Write short note on cybercrime issues?
- Q5] Elaborate need of cybercrime security?
- Q6] Elaborate crime against individuals?
- Q7] Explain cyber extortion?
- Q8] Write short note on scope of cyber crime?
- Q9] What is need for information security? What do you mean by threats to information systems?
- Q10] What do you mean by Information Assurance, Cyber Security, and Security Risk Analysis?

Unit – II- Cyber Crime Issues and Cyber attacks

- Q1] What do you mean by internet hacking and cracking?
- Q2] Write a short note on virus and worm
- Q3] What are cyber crime prevention methods?
- Q4] Write a note on Firewalls and VPNs?
- Q5] What is computer forensics? Explain use of computer forensics in law enforcement?
- Q6] Write a short note on :-Types of military computer forensic technology?
- Q7] What are benefits of professional forensics methodology and computer forensic services?
- Q8] Write a note on data back-up and recovery, role of back-up in data recovery?

UNIT-III - Introduction to Digital Forensics

- Q1] What are collect evidence? What are collection options and obstacles?
- Q2] Write down the type of evidence?
- Q3] What do you mean by controlling contamination?
- Q4] What do you mean by Preservation of Digital Evidence?
- Q5] Write down Computer Evidence Processing Steps?
- Q6] What are the special needs of Evidential Authentication?
- Q7] Write down the collection methods? And collection steps
- Q8] What are Practical Consideration, Practical Implementation?



UNIT-IV-Evidence Collection and Data Seizure

- Q1] How to know to determine what data to collect and analyze, how to validate forensic data, addressing data-hiding techniques?
- Q2] Write down processing Crime and Incident Scenes?
- Q3] How to perform remote acquisitions Network Forensics?
- Q4] What do you mean by seizing digital evidence at the scene, storing digital evidence,obtaining a digital hash?
- Q5] What do you understand by special Needs of Evidential Authentication?
- Q6] What are Computer Evidence Processing Steps?
- Q7] What is legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image Verification and Authentication?
- Q8] What do you mean by the Chain of Custody Duplication and Preservation of Digital Evidence?

UNIT-V - Computer Forensics analysis and validation

- Q1] How to evaluate computer forensic tool needs computer forensics software tools, computer forensics hardware tools?
- Q2] How to validate and test forensics software?
- Q3] What do you mean by E-Mail Investigations?
- Q4] What do you mean by understanding e-mail servers, using specialized e-mail forensic tools?
- Q5] What do you mean by storing digital evidence, obtaining a digital hash, reviewing a case?
- Q6] How to identifying digital evidence and collect evidence in private-sector incident scene?

UNIT-VI- Current Computer Forensic tools

- Q1] How to evaluate computer forensic tool needs?
- Q2] What are computer forensics software tools and computer forensics hardware tools?
- Q3] How to validate and test forensics software E-Mail Investigations?
- Q4] What is role of e-mail in investigation, and role of the client and server in e-mail?
- Q5] How to investigate e-mail crimes and violations?
- Q6] What do you mean by e-mail servers, using specialized e-mail forensic tools?



5. Name of the Course - Object Oriented Modeling and Design(410244D)

5.1 Course Structure

Weekly Workload (In Hrs.)	Lecture	Tutorial	Practical
	3 Hrs./week	-	-

Mid-Sem	End-Sem	Practical	Oral	Term-work	Total Marks	Credit
30	70	-	-	-	100	3

5.2 Prerequisite courses

- Software Engineering(210245)

5.3 Course Objective

- Describe the concepts involved in Object-Oriented modelling and their benefits.
- Demonstrate concept of use-case model, sequence model and state chart model for a given problem.
- Explain the facets of the unified process approach to design and build a Software system.
- Translate the requirements into implementation for Object Oriented design.
- Choose an appropriate design pattern to facilitate development procedure. Select suitable design pattern depending on nature of application.
- To describe Designing and Management of Patterns.

5.4 Course Outcome

On completion of the course, student will be able to–

CO1: Describe the concepts of object-oriented and basic class modelling.

CO2: Draw class diagrams, sequence diagrams and interaction diagrams to solve problems.

CO3: Choose and apply a befitting design pattern for the given problem

CO4: To Analyze applications, architectural Styles & software control strategies

CO5: To develop Class design Models & choose Legacy Systems.

CO6: To Understand Design Patterns.



5.5 Syllabus

Unit No.	Course Contents	Hours
I	Introduction To Modeling	06
	What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.	
II	Advanced Class Modeling and State Modeling	06
	Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips. State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.	
III	Advanced State Modeling and Interaction Modeling	06
	Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips. Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models	
IV	User Application Analysis : System Design	06
	Application Analysis: Application interaction model; Application class model; Application state model; Adding operations. Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example	
V	Class Design ,Implementation Modeling, Legacy Systems	06
	Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example. Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing. Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance	
VI	Design Pattern	06
	What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber. Management Patterns: Command processor; View handler. Idioms: Introduction; what can idioms provide? Idioms and style; Where to find idioms; Counted Pointer example	



5.6 Textbooks:

Sr. No.	Textbooks
T1	Michael Blaha, James Rumbaugh, —Object-Oriented Modeling and Design with UML, 2 nd Edition, Pearson Education, 2005.
T2	Frank Buchmann, Regine Meunier, Hans Rohnert, Peter Sommer lad, Michael Stal, —Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007

5.7 Reference Books:

Sr. No.	Reference books
R1	Grady Booch et al, —Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson Education, 2007
R2	Brahma Dathan, Sarnath Ramnath, —Object-Oriented Analysis, Design, and Implementation, UniversitiesPress, 2009
R3	Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, — UML 2 Toolkit, Wiley- Dreamtech India, 2004
R4	Simon Bennett, Steve McRobb and Ray Farmer, — UML 2 Toolkit, Object- Oriented Systems Analysis and Design Using UML, 2 nd Edition, Tata McGraw-Hill, 2002

5.8 Reference Web Links/ Research Paper

Sr. No.	Web Links/ Research Paper Link
L1	Object Oriented Modeling and Design -https://www.pdfdrive.com/object-oriented-design- HYPERLINK "https://www.pdfdrive.com/object-oriented-design-and-modeling-d10014860.html" and-modeling-d10014860.html
L2	https://www.gopalancolleges.com/gcem/course-material/computer-science/course- HYPERLINK "https://www.gopalancolleges.com/gcem/course-material/computer- science/course-plan/sem-VII/object-oriented-modeling-and-design- 10CS71.pdf"plan/sem-VII/object-oriented-modeling-and-design-10CS71.pdf
L3	https://nptel.ac.in/courses/106105153

5.9 Teaching Plan

Unit No.	Broad Topic to be Covered	Books Referred	Total Lectures Planned
I	Introduction To Modeling	T1,T2,R2	6
II	Advanced Class Modeling and State Modeling	T2,R3,R4	6
III	Advanced State Modeling and Interaction Modeling	T1,R1,R4	6
IV	User Application Analysis : System Design	T1,T2,R2	6
V	Class Design ,Implementation Modeling, Legacy Systems	T1,R2,R3	6
VI	Design Pattern	T2,R1	6



5.10 Schedule Of Assessment Tools

Sr. No.	CO No.	Unit No.	Assessment Tool	Marks	Schedule
1	C404D.1	I, II	Test-1	60	Third week of Aug. 2022
2	C404D.2	III, IV	Test-2	40	Second week of Sep. 2022
3	C404D.3	V, VI	Test-3	20	Third week of Sep. 2022
Total Marks				120	

5.11 Unit wise Lecture Plan

Unit I - Introduction To Modeling

Objectives: -

- To develop problem solving abilities using mathematical theories.
- To apply algorithmic strategies while solving problems.

Outcomes: - Students will be able to,

- Formulate the problem
- Decide and apply algorithmic strategies to solve given problem.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	What is Object Orientation? What is OO development? OO themes.	R2	Board and PPT
2	OO themes; Evidence for usefulness of OO development	T1	Board and PPT
3	OO modeling history Modeling as Design Technique: Modeling; abstraction.	T1 T2	Board and PPT, Problem Solving
4	The three models. Class Modeling: Object and class concepts	T1	Board and PPT, NPTEL video
5	Link and associations concepts; Generalization and inheritance	T1	Board and PPT
6	A sample class model; Navigation of class models	T1	Board and PPT



Unit II - Advanced Class Modeling and State Modeling

Objectives: -

- To analyse performance of different algorithmic strategies in terms of time and space.

Outcomes: - Students will be able to,

- Analyse the asymptotic performance of algorithms

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Advanced object and class concepts; Association ends	T2	Board and PPT, Problem Solving
2	N-ary associations; Aggregation; Abstract classes.	R4	Board and PPT
3	Multiple inheritance; Metadata; Reification; Constraints	R3	Board and PPT, Video
4	Derived data; Packages, State Modeling: Events	R3	Board and PPT
5	States, Transitions and Conditions; State diagrams	T2	Board and PPT
6	State diagrams, State diagram behavior	R4	Board and PPT

Unit III - Advanced State Modeling and Interaction Modeling

Objectives: -

- To apply algorithmic strategies while solving problems.
- To develop time and space efficient algorithms.

Outcomes: - Students will be able to,

- Decide and apply algorithmic strategies to solve given problem
- Find optimal solution by applying various methods

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Advanced State Modeling: Nested state diagrams.	R4	Board and PPT
2	Nested states; Signal generalization; Concurrency	T1,R4	Board and PPT
3	A sample state model; Relation of class and state models	T1,R1	Board and PPT
4	Interaction Modeling: Use case models, Sequence models	R1	Board and PPT
5	Activity models, Use case relationships; Procedural sequence models	R4,T1	Board and PPT
6	Special constructs for activity models	T1	Board and PPT



Unit IV - User Application Analysis : System Design

Objectives: -

- To apply algorithmic strategies while solving problems.
- To develop time and space efficient algorithms.

Outcomes: - Students will be able to,

- Decide and apply algorithmic strategies to solve given problem
- Find optimal solution by applying various methods

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Application Analysis: Application interaction model; Application class model.	T2,R2	Board and PPT
2	Application state model; Adding operations. Overview of system design.	T2	Board and PPT
3	Estimating performance; Making a reuse plan; Breaking a system in to sub-systems.	T1,R2	Board and PPT
4	Identifying concurrency; Allocation of sub-systems; Management of datastorage; Handling global resources.	R2	Board and PPT
5	Choosing a software control strategy; Handling boundary conditions; Setting the trade-off Priorities.	T1,T2	Board and PPT
6	Common architectural styles; Architecture of the ATM system as the example	T1	Board and PPT

Unit V - Class Design, Implementation Modeling, Legacy Systems

Objectives: -

- To apply algorithmic strategies while solving problems.
- To develop time and space efficient algorithms.

Outcomes: - Students will be able to,

- Decide and apply algorithmic strategies to solve given problem
- Analyse and Apply Scheduling and Sorting Algorithms.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Class Design: Overview of class design; Bridging the gap; Realizing use cases.	T1,R2	Board and PPT
2	Designing algorithms; Recursing downwards, Refactoring; Design optimization.	R3	Board and PPT
3	Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.	R2,R3	Board and PPT



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4	Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations.	T1	Board and PPT
5	Realizing associations; Testing. Legacy Systems: Reverse engineering; Building the class models.	T1	Board and PPT
6	Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.	T1,R3	Board and PPT

Unit VI - Design Pattern

Objectives: -

- To study algorithmic examples in distributed and concurrent environments
- To Understand Multithreaded and Distributed Algorithms

Outcomes: - Students will be able to,

- Solve problems for multi-core or distributed or concurrent environments
-

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	What is a pattern and what makes a pattern? Pattern categories.	T2	Board and PPT
2	Pattern categories. Relationships between patterns; Pattern description	R1	Board and PPT
3	Communication Patterns: Forwarder-Receiver. Client-Dispatcher-Server; Publisher-Subscriber.	R1	Board and PPT
4	Management Patterns: Command processor; View handler.	R1	Board and PPT
5	Idioms: Introduction; what can idioms provide?	T2	Board and PPT
6	Idioms and style; Where to find idioms; Counted Pointer example	T2	Board and PPT



5.12 Unit wise Question Bank

Unit I - Introduction To Modeling

Sr. No	Question	Marks	CO	BL	PI	PO
1	What is OOM?	5	C404D. 1	L2	1.4.1	PO1
2	List different steps involved in OOM process.	5	C404D. 1	L1	1.4.1	PO1
3	Differentiate OO development from structured development	5	C404D. 1	L2	7.1.2	PO7
4	What is abstraction?	5	C404D. 1	L3	2.2.3	PO2
5	What is association? Give example of association	5	C404D. 1	L3	5.1.1	PO5
6	What is multiplicity in associations? Give example to explain multiplicity?	5	C404D. 1	L2	5.1.2	PO5
7	What is inheritance? Give an example of multiple inheritance.	5	C404D. 1	L3	5.2.1	PO5
8	Explain the benefit of OOM.	5	C404D. 1	L3	5.3.2	PO5

Unit II - Advanced Class Modeling and State Modeling

Sr. No	Question	Marks	CO	BL	PI	PO
1	Define the following terms, with an example: a)Enumeration b)Association c) Derived data d)Generalization	5	C404D. 1	L4	1.4.1	PO1
2	Define the following terms, with an example: a)Aggregation b)Abstract classes c) Multiplicity d)metadata, packages.	5	C404D. 1	L2	1.4.1	PO1
3	What is constraint? Explain constraint on object, constraint on generalization sets and constraints on links.	5	C404D. 1	L2	1.4.1	PO7
4	Define the purpose of the following term with suitable example and UML notation with respect to class model-package	5	C404D. 1	L3	2.2.3	PO2
5	What do you mean by an event in state diagram? Discuss various types of events.	5	C404D. 1	L2	1.4.1	PO5



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6	What does one shot diagram represent? Show one shot diagram for chess game	5	C404D. 1	L3	1.4.1	PO5
7	Draw data diagram for online reservation system	5	C404D. 1	L4	5.2.1	PO5
8	Draw a state machine diagram for coffee vending machine.	5	C404D. 1	L2	5.3.2	PO5

Unit III - Advanced State Modeling and Interaction Modeling

Sr. No	Question	Marks	CO	BL	PI	PO
1	Model the usecase diagram for Coffee Vending Machine system with descriptions of usecase and actors identified	5	C404D. 2	L3	1.7.1 2.7.1	PO1
2	Model/draw the sequence diagram for 'Login with username and password' showing alternate sequences.	5	C404D. 2	L3	1.7.1 2.7.1	PO1
3	Model/draw the activity diagram for computation of percentage of marks and report card generation in an assessment system. State you assumptions	5	C404D. 2	L3	1.7.1 2.7.1	PO7
4	Explain how do you model an exception in an Activity diagram? Illustrate any two operators used in Sequence diagram	5	C404D. 3	L2	1.7.1	PO2
5	Draw/Model the sequence diagram for the 'Issue book' sequence for a Library Management System showing the actor and sequence of messages	5	C404D. 3	L3	1.7.1 2.7.1	PO5
6	Write the scope of the system for 'Online Book shopping' system and Draw/model the Usecase diagram.	5	C404D. 3	L3	1.7.1 2.7.1	PO5
7	Explain Use case models; Sequence models.	5	C404D. 1	L3	1.7.1	PO5
8	Explain Activity models. Use case relationships	5	C404D. 1	L2	1.7.1	PO5



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Unit IV - User Application Analysis : System Design

Sr. No	Question	Marks	CO	BL	PI	PO
1	Explain Application interaction model; Application class model; Application state model.	5	C404D. 1	L2	1.4.1	PO1
2	Define the overview of system design.	5	C404D. 1	L3	1.4.1	PO1
3	Discuss and Identifying concurrency; Allocation of sub-systems	5	C404D. 1	L2	7.1.2	PO7
4	Discuss Handling global resources and Handling boundary conditions	5	C404D. 1	L2	2.2.3	PO2
5	Explain Setting the trade-off priorities and Common architectural styles	5	C404D. 1	L2	5.1.1	PO5
6	Explain Breaking asystem in to sub-systems.	5	C404D. 1	L3	5.1.2	PO5

Unit V - Class Design, Implementation Modeling, Legacy Systems

Sr. No	Question	Marks	CO	BL	PI	PO
1	Apply Fine tuning classes techniques to ATM system case study.	5	C404D. 5	L3	1.4.1	PO1
2	Apply Fine-tuning generalization techniques to College library system.	5	C404D. 5	L3	1.4.1	PO1
3	Make use of reverse Engineering techniques for building the class model.	5	C404D. 5	L3	7.1.2	PO7
4	Explain Realizing Use cases in context of ATM Transaction case study.	5	C404D. 4	L2	2.2.3	PO2
5	Analyze and model ATM domain class model after class design by considering add operations according to the use cases and adjusting inheritance	5	C404D. 4	L3,L4	5.1.1	PO5
6	Illustrate design algorithm steps in class design.	5	C404D. 1	L2	5.1.2	PO5
7	Explain Building the interaction model.	5	C404D. 1	L2	5.2.1	PO5
8	Explain Building the state model	5	C404D. 1	L2	5.3.2	PO5



Unit VI - Design Pattern

Sr. No	Question	Marks	CO	BL	PI	PO
1	What is Pattern? Discuss pattern categories in detail.	5	C404D. 1	L4	1.4.1	PO1
2	Explain about Client-Dispatcher-Server design pattern.	5	C404D . 1	L5	1.4.1	PO1
3	Define communication design pattern ?	5	C404D. 1	L2	7.1.2	PO7
4	Write a program in JAVA to implement the Publisher-Subscriber pattern .	5	C404D. 1	L5	2.2.3	PO2
5	Discuss structure and variants of the Publisher-Subscriber design pattern?	5	C404D. 1	L2	5.1.1	PO5
6	Explain the structure and implementation of command processor with a diagram.	5	C404D. 1	L5	5.1.2	PO5
7	Write in detail about the structure and dynamics of View Handler.	5	C404D. 1	L3	5.2.1	PO5
8	Describe the various components of Forwarder Receiver design pattern in the structure along with the Dynamics.	5	C404D. 1	L5	5.3.2	PO5



6. Name of the Course – Information Retrieval (410245A)

6.1 Course Structure

Weekly Workload (In Hrs)	Lecture	Tutorial	Practical
	3 Hrs/week	-	-

Midsem	Endsem	Practical	Oral	Term-work	Total Marks	Credit
30	70	-	-	-	100	3

6.2 Prerequisite courses

Database Management Systems

6.3 Course Objective

7. To study basic concepts of Information Retrieval.
8. To study concepts of Indexing for Information Retrieval.
9. To analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia.
10. To provide comprehensive details about various Evaluation methods.
11. To understand the changes necessary to transfer a Basic IR system into large scale search service system.
12. To understand Parallel Information retrieval and Web structures .

6.4 Course Outcome

On completion of the course, student will be able to–

CO1: Implement the concept of Information Retrieval

CO2: Generate quality information out of retrieved information

CO3: Apply techniques such as classification, clustering, and filtering over multimedia to analyse the information

CO4: Evaluate and analyze retrieved information

CO5: Understand the data in various Application and Extensions of information retrieval
CO6: Understand Parallel information retrieving and web structure.



6.5 Syllabus

Unit No.	<u>Course Contents</u>	<u>Hours</u>
I	<u>Introduction , Basic techniques, &Token</u>	07
	<p>Introduction: The IR System, The Software Architecture Of The IR System.</p> <p>Basic IR Models: Boolean Model, TF-IDF (Term Frequency/Inverse Document Frequency) Weighting, Vector Model, Probabilistic Model and Latent Semantic Indexing Model.</p> <p>Basic Tokenizing: Simple Tokenizing, Stop-Word Removal and Stemming.</p>	
II	<u>Static Inverted Indices and Query Processing</u>	07
	<p>Static Inverted Indices :Inverted Index Construction, Index Components and Index Life Cycle, The Dictionary : Sort-based dictionary ,Hash-based dictionary, Interleaving Dictionary and Postings Lists, Index Construction: Different types of Index Construction, In-Memory Index Construction, Sort- Based Index Construction, Merge-Based Index Construction, Disk-Based Index Construction), Other types of Indices.</p> <p>Query Processing : Query Processing for Ranked Retrieval , Document-at-a-Time QueryProcessing, Term-at-a-Time Query Processing, Pre-computing Score Contributions, Impact Ordering)</p> <p>Query optimization, Lightweight Structure : Generalized Concordance Lists, Operators, Implementation & Examples</p>	
III	<u>Index Compression and Dynamic Inverted Indices</u>	07
	<p>General-Purpose Data Compression,</p> <p>Data Compression : Modeling and Coding, Huffman Coding, Arithmetic Coding, Symbolwise Text Compression</p> <p>Compressing Postings Lists:</p> <p>Nonparametric Gap Compression, Parametric Gap Compression, Context-Aware Compression Methods, Index Compression for High Query Performance, Compression Effectiveness, DecodingPerformance, Document Reordering.</p> <p>Dynamic Inverted Indices:</p> <p>Incremental Index Updates, Contiguous Inverted Lists, Noncontiguous Inverted,</p> <p>Document Deletions: Invalidation List, Garbage Collection, Document Modifications,</p>	
IV	<u>Probabilistic Retrieval and Language Modeling & Related</u> <u>Methods , Categorization & Filtering</u>	07
	<p>Probabilistic Retrieval: Modeling Relevance, The Binary Independence Model, Term Frequency, Document Length:BM25, Relevance Feedback, Field Weights;</p> <p>Language Modeling and Related Methods: Generating Queries from Documents, Language Models and Smoothing, Ranking with Language Models, Divergence from Randomness, Passage Retrieval and Ranking</p> <p>Categorization and Filtering: Detailed Examples, Classification, Linear, Similarity- Based, Probabilistic Classifiers, Generalized Linear Models. Information-Theoretic Model.</p>	61



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V	<u>Measuring Effectiveness and Measuring Efficiency</u>	07
	Measuring Effectiveness - Traditional effectiveness measure, The Text Retrieval Conference (TREC), Using statistics in evaluation, Minimizing adjudication Effort, Nontraditional effectiveness measures, Measuring Efficiency – Efficiency criteria, Query Scheduling, Caching, Introduction to Redis and Memcached	
VI	<u>Parallel Information retrieval , Web Search</u>	07
	Parallel Information retrieval - Parallel Query Processing, MapReduce Web Search - The structure of the web, Quieres and Users, Static ranking, Dynamic ranking, Evaluation web search, Web Crawlers, Web crawler libraries, Python Scrapy, Beautiful Soup.	

6.6 Textbooks:

Sr. No.	Textbooks
T1	S. Buttcher, C. Clarke and G. Cormack, -Information Retrieval: Implementing and Evaluating Search Engines MIT Press, 2010, ISBN: 0-408-70929-4.
T2	Manning, P. Raghavan, and H. Schütze, —Introduction to Information Retrieval , Cambridge University Press, 2008, -13: 9780521865715
T3	Ricardo Baeza , Yates and Berthier Ribeiro Neto, —Modern Information Retrieval: The Concepts and Technology behind Search , 2nd Edition, ACM Press Books 2011
T4	Bruce Croft, Donald Metzler and Trevor Strohman, —Search Engines: Information Retrieval in Practicell, 1st Edition Addison Wesley, 2009, ISBN: 9780135756324

6.7 Reference Books:

Sr. No.	Reference books
R1	C.J. Rijsbergen, "Information Retrieval", (http://www.dcs.gla.ac.uk/Keith/Preface.html)
R2	W.R. Hersh, -Information Retrieval: A Health and Biomedical Perspective , Springer, 2002.
R3	G. Kowalski, M.T. Maybury. "Information storage and Retrieval System" , Springer, 2005
R4	4W.B. Croft, J. Lafferty, —Language Modeling for Information Retrieval , Springer, 2003

6.8 Reference Web Links/ Research Paper/ Referred Book

https://onlinecourses.nptel.ac.in
https://nlp.stanford.edu/IR-book/information-retrieval-book.html
https://www.w3schools.com
https://www.tutorialspoint.com
https://mitmecsept.files.wordpress.com

6.9 Teaching Plan

Unit No.	Broad Topic to be covered	Books Referred	Total Lectures Planned
I	Basic IR Models	T2, R2, R3	7
II	Index Construction and Query Processing	T1, R2, T2	7
III	Data Compression	T2, R2	7
IV	Probabilistic Retrieval	T2, R4, R3	7
V	Measuring Effectiveness and Measuring Efficiency	T1, T2, R1	7
VI	Parallel Information retrieval	T2, R6	7

6.10 Schedule Of Assessment Tools

Sr. No.	CO No.	Unit No.	Assessment Tool	Marks	Schedule
1	C405A.1	I, II	Test-1	20	First week of March 2021
2	C405A.2	III, IV	Test-2	20	First week of April 2021
3	C405A.3	V	Skill Test-1	20	Fourth week of April 2021
4	C405A.4	VI	Test-3	20	Second week of May 2021
Total Marks				80	



6.11 Unit wise Lecture Plan

Unit I - Introduction, Basic techniques, &Token

Objectives: -

2. To study and implement the basic concept of Information Retrieval

Outcomes: - Students will be able to,

- Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems.
- Applies engineering mathematics to implement the solution.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Introduction of the IR System	T2	Board and PPT
2	The Software Architecture Of The IR System	T2	Board and PPT
3	Basic IR Models.	T2	Board and PPT

Unit II - Static Inverted Indices and Query Processing

Objectives: -

1. To study concepts of Indexing for Information Retrieval.

Outcomes: - Students will be able to,

- Able to apply computer engineering principles to formulate modules of a system with required applicability and performance.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Static Inverted Indices, Inverted Index Construction, Index Components	T1	Board and PPT
2	Index Construction:	T1	Board and PPT
3	Query Processing : Query Processing for Ranked Retrieval	T2	Board and PPT



Unit III - Index Compression and Dynamic Inverted Indices

Objectives: -

1. To study concepts of Indexing for Information Retrieval.

Outcomes: - Students will be able to,

1. Generate quality information out of retrieved information

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Data Compression	T2	Board and PPT
2	Compressing Postings Lists	T2	Board and PPT
3	Dynamic Inverted Indices	T1	Board and PPT, Discussion
4	Document Deletions	T2	Board and PPT

Unit IV - Probabilistic Retrieval and Language Modeling & Related Methods, Categorization & Filtering

Objectives: -

1. To analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia.
2. To provide comprehensive details about various Evaluation methods.

Outcomes: - Apply techniques such as classification, clustering, and filtering over multimedia to analyze the information.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Probabilistic Retrieval	T1	Board and PPT
2	Language Modeling and Related Methods	T1	Board and PPT, Discussion
3	Categorization and Filtering:	T2	Board and PPT

Unit V - Measuring Effectiveness and Measuring Efficiency

Objectives: -

To analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia.

Outcomes: -

- Evaluate and analyze retrieved information.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Measuring Effectiveness	T2	Board and PPT
2	Measuring Efficiency	T2	Board and PPT



Unit VI - Parallel Information retrieval, Web Search

Objectives: -

1. To understand Parallel Information retrieval and Web structures

Outcomes: -

1. Understand the data in various Application and Extensions of information retrieval.
2. Understand Parallel information retrieving and web structure.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Parallel Information retrieval	T2	Board and PPT
2	Web Search	T1	Board and PPT

6.12 Unit wise Question Bank

Unit I - Introduction, Basic techniques, &Token

Sr. No	Question	Marks	CO	BL	PI	PO
1	Describe software architecture of the IR system.	5	CO415.1	L2	1.4.1	PO4
2	Explain TF-IDF weighting with example.	5	CO415.1	L3	1.4.1	PO1
3	Difference between data retrieval and Information retrieval.	5	CO415.1	L2	1.1.2	PO2
4	Write short note on probabilistic model.	5	CO415.1	L2	1.2.3	PO2
5	Explain Latent Semantic Indexing Model.	5	CO415.1	L3	1.4.1	PO1
6	Explain Vector Model in detail.	5	CO415.1	L3	1.1.2	PO1
7	Describe Boolean Model in detail	5	CO415.1	L2	1.1.2	PO1
8	Explain the Information Retrieval.	5	CO415.1	L3	1.1.2	PO4

Unit II - Static Inverted Indices and Query Processing

Sr. No	Question	Marks	CO	BL	PI	PO
1	Explain Inverted Index file. How it can be used in Information retrieval.	5	CO415.2	L3	2.2.1	PO3
2	Write note on Query Processing in distributed Information retrieval.	5	CO415.2	L2	2.3.2	PO4
3	Explain different types of Index Construction	5	CO415.2	L3	2.1.1	PO2



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4	Explain exhaustively and specificity with respect to Index term weighting.	5	CO415.2	L3	4.1.2	PO4
5	Explain the concept of hash addressing.	5	CO415.2	L3	4.1.2	PO4
6	Write note on Index life cycle	5	CO415.2	L2	2.1.2	PO2
7	Explain Term-at-time query processing	5	CO415.2	L3	2.4.1	PO2
8	Write short note on Query Optimization	5	CO415.2	L2	4.1.2	PO4

Unit III - Index Compression and Dynamic Inverted Indices

Sr. No	Question	Marks	CO	BL	PI	PO
1	Explain Huffman Coding with example.	5	CO415.2	L3	1.2.2	PO1
2	Write note on Text Compression in Information retrieval.	5	CO415.2	L3	4.3.2	PO4
3	Explain Arithmetic Coding.	5	CO415.2	L2	2.1.1	PO2
4	Deference between Nonparametric Gap Compression, Parametric Gap Compression	5	CO415.2	L3	3.1.3	PO3
5	Explain the Decoding Performance	5	CO415.2	L3	4.1.2	PO4
6	Describe Contiguous Inverted Lists and Noncontiguous Inverted	5	CO415.2	L3	3.1.2	PO3

Unit IV - Probabilistic Retrieval and Language Modeling & Related Methods , Categorization & Filtering

Sr. No	Question	Marks	CO	BL	PI	PO
1	Explain Binary Independence Model in Information retrieval.	5	CO415.3	L2	3.2.1	PO3
2	Write note on BM25 in Information retrieval.	5	CO415.3	L2	3.3.2	PO3
3	Describe Language Models in Information retrieval.	5	CO415.3	L3	2.1.1	PO2
4	Explain Probabilistic Classifiers.	5	CO415.3	L3	4.1.2	PO4
5	Explain types generalized Linear Models types.	5	CO415.3	L2	3.2.3	PO3
6	Write note on Information-Theoretic Model.	5	CO415.3	L2	2.1.2	PO2



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Unit V - Measuring Effectiveness and Measuring Efficiency

Sr. No	Question	Marks	CO	BL	PI	PO
1	What is traditional information retrieval system explain in detail.	5	CO415.4	L3	3.3.1	PO3
2	What does TREC stand for in information retrieval explain in detail?	5	CO415.4	L2	4.1.2	PO4
3	Write short on Query Scheduling.	5	CO415.4	L3	2.1.1	PO2
4	Explain Redis and Memcached and differentiate them.	5	CO415.4	L3	4.2.3	PO4
5	Explain the concept of Caching.	5	CO415.4	L3	4.1.2	PO4

Unit VI - Parallel Information retrieval, Web Search

Sr. No	Question	Marks	CO	BL	PI	PO
1	Explain Parallel Query Processing in Information retrieval.	5	CO415.5	L3	5.2.1	PO5
2	Explain MapReduce algorithm in Information retrieval.	5	CO415.6	L3	4.3.2	PO4
3	Enlist the Web Crawlers libraries and explain the Web Crawlers.	5	CO415.6	L3	3.2.2	PO3
4	Explain the structure of the web.	5	CO415.5	L3	5.3.1	PO5
5	Differentiate between Static ranking and Dynamic ranking.	5	CO415.2	L4	4.1.2	PO4



7. Name of the Course – Software Testing and Quality Assurance (STQA) 410245-D

7.1 Course Structure

Weekly Work Load(in Hrs)	Lecture	Tutorial	Practical
	03	-	02

Online/ In-sem	Theory	Practical	Oral	Term-work	Total Marks	Credit
STQA	30+70	-	-	-	100	
LP-II	-	-	-	50	100	

7.2 Course Objective

- Introduce basic concepts of software testing.
- Understand the best way to increase the effectiveness, test coverage, and execution speed in software testing.
- Understand white box, block box, object oriented, web based and cloud testing.
- Understand the importance of software quality and assurance software systems development.
- Know in details automation testing and tools used for automation testing.
- To learn and understand the combination of practices and tools that are designed to help QA professionals test more efficiently.

7.3 Syllabus

UNIT – I		
Introduction to Software Testing		
<p>Introduction: historical perspective, Definition, Core Components, Customers suppliers and process, Objectives of Testing, Testing and Debugging, Need of Testing, Quality Assurance and Testing, Why Software has Errors, Defects and Failures and its Causes and Effects, Total Quality Management(TQM), Quality practices of TQM, Quality Management through- Statistical process Control, Cultural Changes, Continual Improvement cycle, Benchmarking and metrics, Problem Solving Techniques and Software Tools.</p> <p>Software Quality, Constraints of Software Product Quality assessment, Quality and Productivity Relationship, Requirements of Product, Software Development Process, Types of Products, Software Development Lifecycle Models, Software Quality Management, Processes related to Software Quality, Quality Management System 's Structure, Pillars of Quality Management System, Important aspects of quality management.</p>		
Outcomes – At the end of this unit students will be able to -		No. of Lectures – 07
Sr. No.	Learning Outcomes	Bloom's Level
1	Enlist & explain important aspect of quality management	L1,L2
2	Describe 'Total Quality Management' principles of continual improvement.	L2
3	Explain the term 'Software quality Assurance'. List the different SQA activities performed to assure the quality of the product.	L1,L2
		69



UNIT – II

Test Planning and Quality Management

Artifacts, Strategy, Test Organization –Test Manager & Tester Role, Test plan purpose & contents, Test Strategy and Approach, Test cases & Test Data, Test Entry-Exit criteria, Test Execution Schedule, Use case Testing, Scenario Testing, Test Monitoring & Control- Test Metrics – Test Case Productivity, Test case Coverage, Defect Acceptance & Rejection, Test Efficiency, Efforts and Schedule Variance, Test Efforts biasing Factors, Test Report & configuration Management, Quality Assurance Process, Documentation Risk & Issues. Software Quality, Quality Management Importance, Quality Best practices.

Outcomes – At the end of this unit students will be able to -		No. of Lectures – 09
Sr. No.	Learning Outcomes	Bloom's Level
1	Describe software Defect life Cycle.	L2
2	Illustrate and compare different Test methodologies	L2
3	State and explain all components of a Test Plan	L1,L2

UNIT – III

Software Testing Methodologies: White Box Testing, Black Box Testing, Grey Box Testing. Test Case Design Techniques: Static Techniques: Informal Reviews, Walkthroughs, Technical Reviews, Inspection. Dynamic Techniques: Structural Techniques: Statement Coverage Testing, Branch Coverage Testing, Path Coverage Testing, Conditional Coverage Testing, Loop Coverage Testing Black Box Techniques: Boundary Value Analysis, Equivalence Class Partition, State Transition Technique, Cause Effective Graph, Decision Table, Use Case Testing, Experienced Based Techniques: Error guessing, Exploratory testing

Levels of Testing: Functional Testing: Unit Testing, Integration Testing, System Testing, User Acceptance Testing, Sanity/Smoke Testing, Regression Test, Retest. Non-Functional Testing: Performance Testing, Memory Test, Scalability Testing, Compatibility Testing, Security Testing, Cookies Testing, Session Testing, Recovery Testing, Installation Testing, Adhoc Testing, Risk Based Testing, I18N Testing, L1ON Testing, Compliance Testing.

Outcomes – At the end of this unit students will be able to -		No. of Lectures – 09
Sr. No.	Learning Outcomes	Bloom's Level
1	Explain Software Testing Methodologies	L2
2	Identify the types of testing	L2



UNIT – IV

Software Quality Assurance and Quality Control

Software Quality Assurance: Introduction, Constraints of Software Product Quality Assessment, Quality and Productivity Relationship, Requirements of a Product, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.

Software Quality Control: Software quality models, Quality measurement and metrics, Quality plan, implementation and documentation, Quality tools including CASE tools, Quality control and reliability of quality process, Quality management system models, Complexity metrics and Customer Satisfaction, International quality standards – ISO, CMM

Outcomes – At the end of this unit students will be able to -	No. of Lectures – 09
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Sr. No.	Learning Outcomes	Bloom's Level
1	Explain the goals and tasks of SQA.	L3
2	List the requirements of ISO 9000	L1

UNIT – V

Automation Testing Tools / Performance Testing Tools

Automation Testing: What is automation testing, Automated Testing Process, Automation Frameworks, Benefits of automation testing, how to choose automation testing tools. Selenium Automation Tools: Selenium 's Tool Suite- Selenium IDE, Selenium RC, Selenium Web driver, Selenium Grid. Automation Tools: SoapUI, Robotic Process Automation (RPA), Tosca, Appium.

Outcomes – At the end of this unit students will be able to -	No. of Lectures – 09
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Sr. No.	Learning Outcomes	Bloom's Level
1	Enlist and Explain the components of Selenium Tool.	L2,L3
2	Explain the following terms. 1) Selenium- IDE, 2) Selenium RC, 3) Selenium Webdriver, 4) Selenium Grid.	L3



UNIT – VI

Testing Framework

Testing Framework: Software Quality, Software Quality Dilemma, Achieving Software Quality, Software Quality Assurance Elements of SQA, SQA Tasks, Goals and Metrics, Formal Approaches to SQA, Statistical Software Quality Assurance, Six Sigma for Software Engineering, ISO 9000 Quality Standards, SQA Plan, Total Quality Management, Product Quality Metrics, In process Quality Metrics, Software maintenance, Ishikawa's 7 basic tools, Flow Chart, Checklists, Pareto diagrams, Histogram, Run Charts, Scatter diagrams, Control chart, Cause Effect diagram. Defect Removal Effectiveness and Process.

Outcomes – At the end of this unit students will be able to -

No. of Lectures – 09

Sr. No.	Learning Outcomes	Bloom's Level
1	Enumerate Ishikawa's 7 basic quality tools. Explain any two in detail.	L2,L3
2	Explain with an example the Cause Effect diagram to analyze a software defect.	L2,L3

7.4 Text Books

Sr. No	Book	Text Books
1	T1	M G Limaye, “Software Testing Principles, Techniques and Tools”, Tata McGraw Hill, ISBN: 9780070139909 0070139903
2	T2	Srinivasan Desikan, Gopalswamy Ramesh, “Software Testing Principles and Practices”, Pearson, ISBN-10: 817758121X

7.5 Reference Books

Sr. No	Book	Text Books
1	R1	Srinivasan Desikan, Gopalswamy Ramesh, “Software Testing Principles and Practices”, Pearson, ISBN-10: 817758121X
2	R2	Stephen Kan, “Metrics and Models in Software Quality Engineering”, Pearson, ISBN-10: 0133988082; ISBN-13: 978-0133988086

7.6 Reference Web Links/ Research Paper/ Referred Book other than Mention in Syllabus:

1. <https://github.com/SeleniumHQ/selenium>
2. <https://www.selenium.dev/>



7.7 Teaching Plan

Sr. No.	Unit	Broad Topic to be covered	Books Referred	Total Lectures Planned
I :	Introduction , Software Quality	T1,T2	8	8
II :	Test Planning and Management	T1,R1	8	7
III :	Software Test Automation	T1,T2	8	8
IV :	Selenium Tool	Web Link	8	7
V :	Quality Management	T1,R2	8	8
VI :	Software Quality Tools	T1,R2	8	7

7.8 Question Bank

Unit 1: Introduction

Q. No	Questions
1	Explain 'Quality' in terms of the generic expectations from any product.
2	Differentiate between continuous improvement and continual improvement.
3	Define the stakeholders for successful projects at micro level and for successful organizations at macro level.
4	Define 'quality' as viewed by different stakeholders of software development and usage.
5	Explain customers view of quality.
6	Explain manufacturers view of quality.
7	Define 'User's Gap' nad 'Producer's Gap' and explain how these gaps can be closed effectively.
8	Describe various definitions of quality as per international standards.
9	Describe definition of quality as per Dr. Deming, Dr. Juran and philip Crosby.
10	Describe 'Total Quality Management' principles of continual improvement.
11	Describe cultural change requirement for quality improvement.
12	Differentiate between tools and techniques.
13	What are the constraints of software requirement specifications?
14	Explain relationship between quality and productivity.
15	Explain the concept of 'q' organizations and 'Q' organizations.

Unit 2: Test Planning and Management

Q. No	Questions
1	Explain the evolution of software testing from debugging to prevention based testing.
2	Explain why independent testing is required.
3	Explain big bang approach of software testing.
4	Explain total quality management approach of software testing.
5	Explain concept of TQM cost perspective.
6	Explain testing as a process of software certification.
7	Explain the basic principles on which testing is based.
8	Explain the concept of test team's defect finding efficiency.
9	Explain test case's defect finding efficiency.
10	What are the challenges faced by testers.
11	Explain the process of developing test strategy.
12	Explain the process of developing test methodology.
13	Which skills are expected in a good tester.

Unit 3: Software Test Automation

Q. No	Questions
1	What do you know about Selenium?
2	What are the technical challenges with selenium?
3	What are the test types supported by Selenium?
4	What are the capabilities of Selenium IDE?
5	What are the challenges with Selenium IDE?
6	Which are the browsers supported by Selenium IDE?
7	How to execute a single line command from Selenium IDE?
8	How to insert a start point in Selenium IDE?
9	How to insert a comment in Selenium IDE?
10	How to insert a break point in Selenium IDE?
11	How to debug the tests in Selenium IDE?
12	How to export the tests from Selenium IDE to Selenium RC in different languages?



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13	How to export Selenium IDE Test Suite to Selenium RC Suites?
14	Which is the command used for displaying the values of a variable into the output console or log?
15	Which are the browsers supported by Selenium RC?
16	Which are the Operating Systems supported by Selenium?
17	What is Selenium RC? 18. Why Selenium RC is used?
18	Which are the languages supported by Selenium RC?
19	What is Selenium Grid?
20	What is Selenium WebDriver or Google WebDriver or Selenium 2.0?
21	What are the capabilities of Selenium WebDriver or Google WebDriver or Selenium 2.0?
22	What is the architecture of Selenium RC?

Unit 4: Selenium Tool

Q. No	Questions
1	What is Automation Testing?
2	What are the advantages/benefits of Automation Testing?
3	How many Test cases have you automated per day?
4	What is Selenium?
5	What are the different Selenium suite Components?
6	Why should I use Selenium?



8. Name of the Course - Compilers (410245(E))

8.1 Course Structure

Weekly Workload (In Hrs)	Lecture	Tutorial	Practical
	3 Hrs/week	-	-

Midsem	Endsem	Practical	Oral	Term-work	Total Marks	Credit
30	70	-	-	-	100	3

8.2 Prerequisite courses

1. Theory of Computation (310241)
2. Systems Programming and Operating System. (310251)

8.3 Course Objective

13. To aware about language translation theories and compiler design stages.
14. To illustrate the various parser configurations.
15. To exemplify the use of syntax directed translation in intermediate code.
16. To understand Storage Management and Control Structure Environment.
17. To learn to develop a Code generator.
18. To demonstrate the numerous optimization methods used in the creation of different optimizing compiler.

8.4 Course Outcome

On completion of the course, student will be able to–

- C407E.1: Design** and implement a lexical analyzer using LEX tools
- C407E.2: Design** and implement a syntax analyzer using YACC tools
- C407E.3: Understand** syntax-directed translation and run-time environment
- C407E.4: Generate** intermediate codes for high-level statements
- C407E.5: Construct** algorithms to produce computer code
- C407E.6: Analyze and transform** programs to improve their time and memory efficiency



8.5 Syllabus

Unit No.	<u>Course Contents</u>	<u>Hours</u>
I	<u>Notion and Concepts</u>	08
	Introduction to compilers Design issues, passes, phases, symbol table Preliminaries Memory management, Operating system support for compiler, Lexical Analysis Tokens, Regular Expressions, Process of Lexical analysis, Block Schematic, Automatic construction of lexical analyzer using LEX, LEX features and specification.	
II	<u>Parsing</u>	08
	Syntax Analysis CFG, top-down and bottom-up parsers, RDP, Predictive parser, SLR, LR(1), LALR parsers, using ambiguous grammar, Error detection and recovery, automatic construction of parsers using YACC, Introduction to Semantic analysis, Need of semantic analysis, type checking and type conversion.	
III	<u>Syntax Translation Schemes</u>	08
	Syntax Directed Translation - Attribute grammar, S and L attributed grammar, bottom up and top down evaluations of S and L attributed grammar, Syntax directed translation scheme, Intermediate code - need, types: Syntax Trees, DAG, Three-Address codes: Quadruples, Triples and Indirect Triples, Intermediate code generation of declaration statement and assignment statement.	
IV	<u>Run-time Storage Management</u>	08
	Storage Management – Static, Stack and Heap, Activation Record, static and control links, parameter passing, return value, passing array and variable number of arguments, Static and Dynamic scope, Dangling Pointers, translation of control structures – if, if-else statement, Switch case, while, do -while statements, for, nested blocks, display mechanism, array assignment, pointers, function call and return. Translation of OO constructs: Class, members and Methods	
V	<u>Code Generation</u>	07
	Code Generation - Issues in code generation, basic blocks, flow graphs, DAG representation of basic blocks, Target machine description, peephole optimization, Register allocation and Assignment, Simple code generator, Code generation from labeled tree, Concept of code generator	
VI	<u>Code Optimization</u>	07
	Need for Optimization, local, global and loop optimization, Optimizing transformations, compile time evaluation, common sub-expression elimination, variable propagation, code movement, strength reduction, dead code elimination, DAG based local optimization, Introduction to global data flow analysis, Data flow equations and iterative data flow analysis.	



8.6 Textbooks:

Sr. No.	Textbooks
T1	1. V Aho, R Sethi, J D Ullman, "Compilers: Principles, Techniques, and Tools", Pearson Edition, ISBN 81-7758-590-8
T2	2. Dick Grune, Bal, Jacobs, Langendoen, "Modern Compiler Design", Wiley, ISBN 81-265-0418-8

8.7 Reference Books:

Sr. No.	Reference books
R1	Anthony J. Dos Reis, "Compiler Construction Using Java", JavaCC and Yacc Wiley, ISBN 978-0-470-94959-7
R2	K Muneeswaran, "Compiler Design", Oxford University press, ISBN 0-19-806664-3
R3	J R Levin, T Mason, D Brown, "Lex and Yacc", O'Reilly, 2000 ISBN 81-7366-061-X

8.8 Reference Web Links/ Research Paper/ Referred Book

e-Books : Basics of Compiler Design http://hjemmesider.diku.dk/~torbenm/Basics/basics_lulu2.pdf
Modern Compiler Design http://160592857366.free.fr/joe/ebooks/ShareData/Modern%20Compiler%20Design%20e.pdf
NPTEL Courses links: https://nptel.ac.in/courses/106105190

8.9 Teaching Plan

Unit No.	Broad Topic to be covered	Books Referred	Total Lectures Planned
I	Notion and Concepts	T1, R1, R3	8
II	Parsing	T1, R2, T2	8
III	Syntax Translation Schemes	T1, R3	8
IV	Run-time Storage Management	T1, R1	8
V	Code Generation	T1, T2, R1	7
VI	Code Optimization	T1, R2	7



8.10 Schedule of Assessment Tools

Sr. No.	CO No.	Unit No.	Assessment Tool	Marks	Schedule
1	C407E.1	I	Test-1	10	First week of August 2022
2	C407E.2	II	Test-1	10	First week of August 2022
3	C407E.3	III	Test-2	10	First week of Sept 2022
4	C407E.4	VI	Test-2	10	First week of Sept 2022
5	C407E.5	V	Test-3	10	First week of Oct 2022
6	C407E.6	VI	Test-3	10	First week of Oct 2022
Total Marks				60	

8.11 Unit wise Lecture Plan

Unit I - Notion and Concepts

Objectives: -

3. To aware about language translation theories and compiler design stages.

Outcomes: - Students will be able to,

- **Design** and implement a lexical analyzer using LEX tools.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Introduction to Compilers	T1	Board and PPT
2	Design issues, passes, phases of the compilers.	T1	Board and PPT
3	Symbol table Preliminaries Memory management	T2	Board and PPT
4	Operating system support for compiler, Lexical Analysis , Tokens	T2	Board and PPT
5	CFG, Regular Expressions	T2, R2	Board and PPT
6	Process of Lexical analysis, Block Schematic, Automatic construction of lexical analyzer using LEX	R2	Board and PPT
7	LEX Tool with Example	R2	Board and PPT
8	LEX features and specification.	T1	Board and PPT



Unit II - Parsing

Objectives: -

- To illustrate the various parser configurations.

Outcomes: - Students will be able to,

- Design** and implement a syntax analyzer using YACC tools.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Introduction to Syntax Analysis, CFG	T1	Board and PPT
2	Top-down and bottom-up parsers, RDP, Predictive parser,	T1	Board and PPT
3	Bottom-up Parser SLR, LR(1), LALR parsers,	T2	Board and PPT
4	Difference between SLR, LR(1), LALR parsers	T2	Board and PPT
5	Parsers using ambiguous grammar, Error detection and recovery	T2, R2	Board and PPT
6	Automatic construction of parsers using YACC,	R2	Board and PPT
7	Introduction to Semantic analysis, Need of semantic analysis	R2	Board and PPT
8	Type checking and type conversion	T1	Board and PPT

Unit III – Syntax Translation Schemes

Objectives: -

- To exemplify the use of syntax directed translation in intermediate code

Outcomes: - Students will be able to,

- Understand** syntax-directed translation and run-time environment

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Syntax Directed Translation - Attribute grammar	T1	Board and PPT
2	S and L attributed grammar with example. Difference between S and L attributed grammar	T1	Board and PPT
3	Bottom up and top down evaluations of S and L attributed grammar	T2	Board and PPT
4	Syntax directed translation scheme, Intermediate code - need, types	T2	Board and PPT
5	Syntax Trees, DAG, Three-Address codes	T2, R2	Board and PPT
6	Quadruples, Triples and Indirect Triples,	R2	Board and PPT
7	Examples of Quadruples, Triples and Indirect Triples	R2	Board and PPT
8	Intermediate code generation of declaration statement and assignment statement	T1	Board and PPT



Unit IV – Run-time Storage Management

Objectives: -

6. To understand Storage Management and Control Structure Environment.

Outcomes: - Students will be able to,

- **Generate** intermediate codes for high-level statements

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Storage Management – Static, Stack and Heap	T1	Board and PPT
2	Activation Record, static and control links,	T1	Board and PPT
3	Parameter passing, return value, passing array and variable number of arguments	T2	Board and PPT
4	Static and Dynamic scope, Dangling Pointers, translation of control structures – if, if-else statement	T2	Board and PPT
5	Translation of control structures : Switch case, while, do -while statements	T2, R2	Board and PPT
6	Translation of control structures :for, nested blocks,	R2	Board and PPT
7	display mechanism, array assignment, pointers, function call and return.	R2	Board and PPT
8	Translation of OO constructs: Class, members and Methods	T1	Board and PPT

Unit V – Code Generation

Objectives: -

7. To learn to develop a Code generator

Outcomes: - Students will be able to,

- **Construct** algorithms to produce computer code

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Introduction to Code Generation - Issues in code generation,	T1	Board and PPT
2	basic blocks, flow graphs	T1	Board and PPT
3	DAG with example	T2	Board and PPT
4	representation of basic blocks, Target machine description,	T2	Board and PPT
5	peephole optimization, Register allocation and Assignment	T2, R2	Board and PPT
6	Simple code generator, Code generation from labeled tree	R2	Board and PPT
7	Concept of code generator	R2	Board and PPT



Unit VI – Code Optimization

Objectives: -

8. To demonstrate the numerous optimization methods used in the creation of different optimizing compiler.

Outcomes: - Students will be able to,

- **Analyze and transform** programs to improve their time and memory efficiency

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Need for Optimization, local, global and loop optimization	T1	Board and PPT
2	Optimizing transformations, compile time evaluation	T1	Board and PPT
3	Optimization Techniques: common sub-expression elimination, variable propagation	T2	Board and PPT
4	Optimization Techniques: code movement, strength reduction, dead code elimination	T2	Board and PPT
5	DAG based local optimization	T2, R2	Board and PPT
6	Introduction to global data flow analysis	R2	Board and PPT
7	Data flow equations and iterative data flow analysis	R2	Board and PPT

8.12 Unit wise Question Bank

Unit I - - Notion and Concepts

Sr. No	Question	Marks	CO	BL	PI	PO
1	Explain phases of compiler.	5	C407E. 1	L2	1.4.1	PO1
2	Experiment with Lex Tool.	5	C407E. 1	L2	1.4.1	PO5
3	Explain the LEX features and specification.	5	C407E. 1	L2	7.1.2	PO5
4	Explain with diagram how a statement is compiled.	5	C407E. 1	L2	2.2.3	PO2
5	Demonstrate diagrammatically the role of lexical analyzer in detail.	5	C407E. 1	L2	5.1.1	PO5
6	Classify Token, Patterns and Lexemes with example.	5	C407E. 1	L2	5.1.2	PO2
7	Explain design issues in compiler.	5	C407E. 1	L2	1.4.1	PO1

Unit II – Parsing

Sr. No	Question	Marks	CO	BL	PI	PO
1	Classify top-down and bottom-up parser.	5	C407E. 2	L2	1.4.1	PO2
2	Apply various parsing techniques to construct compiler.	5	C407E. 2	L4	1.4.1	PO1
3	Explain need of semantic analysis, type checking and type conversion	5	C407E. 2	L2	7.1.2	PO4
4	Explain Error recovery strategies in Parser	5	C407E. 2	L2	2.2.3	PO2
5	Explain the algorithm to create Predictive parsing table with the scanning of input string.	5	C407E. 2	L2	5.1.1	PO2
6	Construct first and follow for the following grammar. $E \rightarrow TE'$ $E' \rightarrow +TE' \epsilon$ $T \rightarrow FT'$ $T' \rightarrow *FT' \epsilon$ $F \rightarrow (E) id$	5	C407E. 2	L4	5.1.2	PO2
7	Explain the need of symbol table in compiler. List and explain any two operations carried out symbol table.	5	C407E. 2	L3	5.2.1	PO2
8	List the three conditions (rules) that should be satisfied by a grammar that is LL (1)? Using these rules, check if grammar given below is LL (1) but not SLR (1). $S \rightarrow AaAb BbBa$ $A \rightarrow \epsilon$ $B \rightarrow \epsilon$	5	C407E. 2	L4	5.3.2	PO2

Unit III - Syntax Translation Schemes

Sr. No	Question	Marks	CO	BL	PI	PO
1	Explain Syntax Directed Translation and Attribute grammar.	5	C407E. 3	L2	1.4.1	PO1
2	Construct Intermediate code for 'C' construct.	5	C407E. 3	L2	1.4.1	PO1
3	Explain need and types of Intermediate code	5	C407E. 3	L2	7.1.2	PO2
4	Demonstrate Bottom-up evaluation of synthesized attribute with example.	5	C407E. 3	L2	2.2.3	PO2
5	Explain S attribute and L attribute with example.	5	C407E. 3	L2	5.1.1	PO2
6	Compare Quadruple and Triple. Construct indirect Triple for the following. $a=b*c-d-e$	5	C407E. 3	L3	5.1.2	PO2
7	Demonstrate Intermediate code generation of declaration statement	5	C407E. 3	L2	5.2.1	PO1



Unit IV - Run-time Storage Management

Sr. No	Question	Marks	CO	BL	PI	PO
1.	Demonstrate need and use of storage.	5	C407E. 4	L2	1.4.1	PO1
2.	Explain with suitable example code fragments and various parameter passing methods.	5	C407E. 4	L2	1.4.1	PO1
3.	Explain the various storage allocation schemes with proper example.	5	C407E. 4	L2	7.1.2	PO2
4.	Write the definition of symbol table and procedure to store the names in symbol table.	5	C407E. 4	L2	2.2.3	PO2
5.	What is activation record? Write the various fields of Activation Record.	5	C407E. 4	L2	5.1.1	PO2
6.	Write the comparison among Static allocation, Stack allocation and Heap Allocation with their merits and limitations.	5	C407E. 4	L2	5.1.2	PO2
7.	What are the data structures used in symbol table?	5	C407E. 4	L3	5.2.1	PO2
8.	Write a short note on Error Detection and Recovery	5	C407E. 4	L5	5.3.2	PO2

Unit V – Code Generation

Sr. No	Question	Marks	CO	BL	PI	PO
1	Construct the target code using Intermediate code	5	C407E. 5	L4	1.4.1	PO1
2	Explain DAG representation of basic blocks	5	C407E. 5	L2	1.4.1	PO1
3	What are basic blocks? Write the algorithm for partitioning into Blocks	5	C407E. 5	L2	7.1.2	PO2
4	What are the properties of code generation phase? Also explain the Design Issues of this phase.	5	C407E. 5	L2	2.2.3	PO2
5	Write a short note on: a. Flow graph (with example) b. Dominators c. Natural loops d. Inner loops e. Reducible flow graphs	5	C407E. 5	L2	5.1.1	PO2
6	Explain labeling algorithm in detail with example	5	C407E. 5	L2	5.1.2	PO2
7	Explain global and loop optimization	5	C407E. 5	L2	5.2.1	PO2
8	Explain DAG based local optimization	5	C407E. 5	L2	5.3.2	PO2



Unit IV – Code Optimization

Sr. No	Question	Marks	CO	BL	PI	PO
1	Demonstrate need and use of code optimization.	5	C407E. 6	L2	1.4.1	PO1
2	Explain the various methods of code optimization	5	C407E. 6	L2	1.4.1	PO1
3	Write a short note with example to optimize the code: a. Dead code elimination b. Variable elimination c. Code motion d. Reduction in strength	5	C407E. 6	L2	7.1.2	PO2
4	What is control and data flow analysis? Explain with example.	5	C407E. 6	L2	2.2.3	PO2
5	What is common sub-expression and how to eliminate it? Explain with example.	5	C407E. 6	L2	5.1.1	PO2
6	What is code optimization? Explain machine dependent and independent code optimization.	5	C407E. 6	L2	5.1.2	PO2
7	What is peephole optimization?	5	C407E. 6	L3	5.2.1	PO1
8	What is Data flow equations and iterative data flow analysis?	5	C407E. 6	L2	5.3.2	PO1



9. Name of the Course - Laboratory Practice III (410246)

9.1 Course Structure

Weekly Workload (In Hrs)	Lecture	Tutorial	Practical
	-	-	4 Hrs/week

Midsem	Endsem	Practical	Oral	Term-work	Total Marks	Credit
-	-	50	-	50	100	2

9.2 Companion Course Laboratory Practice III (410246)

9.3 Course Objectives:

- Learn effect of data preprocessing on the performance of machine learning algorithms
- Develop in depth understanding for implementation of the regression models.
- Implement and evaluate supervised and unsupervised machine learning algorithms.
- Analyze performance of an algorithm.
- Learn how to implement algorithms that follow algorithm design strategies namely divide and conquer, greedy, dynamic programming, backtracking, branch and bound.
- Understand and explore the working of Blockchain technology and its applications.

9.4 Course Outcomes

At the end of the course students will be able to,

- CO1: Apply preprocessing techniques on datasets.
- CO2: Implement and evaluate linear regression and random forest regression models.
- CO3: Apply and evaluate classification and clustering techniques.
- CO4: Analyze performance of an algorithm.
- CO5: Implement an algorithm that follows one of the following algorithm design strategies: divide and conquer, greedy, dynamic programming, backtracking, branch and bound.
- CO6: Interpret the basic concepts in Blockchain technology and its applications



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CO No.	Year of study 2022-23	Mapping to POs/PSOs		
		Substantial	Moderate	Low
CO1	Apply preprocessing techniques on datasets.	1,2,3,12	5,9,11	4,6,8
CO2	Implement and evaluate linear regression and random forest regression models.	1,2,3,12	4,5,9,11	6,8
CO3	Apply and evaluate classification and clustering techniques.	1,2,3,12	4,5,6,9,11	1
CO4	Analyze performance of an algorithm	1	2,3,9,11,12	5,8
CO5	Implement an algorithm that follows one of the following algorithm design strategies: divide and conquer, greedy, dynamic programming, backtracking, branch and bound.	1,3	2,9,12	5,8
CO6	Interpret the basic concepts in Blockchain technology and its applications	1,2	3,4,5,9,12	8

9.5 List of Assignments

Course No.	Sr. No.	Title
		Group A: Design and Analysis of Algorithms
C41024 6	LA1	Write a program non-recursive and recursive program to calculate Fibonacci numbers and analyze their time and space complexity.
	LA2	Write a program to implement Huffman Encoding using a greedy strategy.
	LA3	Write a program to solve a fractional Knapsack problem using a greedy method
	LA4	Write a program to solve a 0-1 Knapsack problem using dynamic programming or branch and bound strategy.
	LA5	Design n-Queens matrix having first Queen placed. Use backtracking to place remaining Queens to generate the final n-queen's matrix.
	LA6	Write a program for analysis of quick sort by using deterministic and randomized variant.
	MiniPrj 7	Write a program to implement matrix multiplication. Also implement multithreaded matrix multiplication with either one thread per row or one thread per cell. Analyze and compare their performance.



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MiniPrj 8	Implement merge sort and multithreaded merge sort. Compare time required by both the algorithms. Also analyze the performance of each algorithm for the best case and the worst case.
MiniPrj 9	Implement the Naive string matching algorithm and Rabin-Karp algorithm for string matching. Observe difference in working of both the algorithms for the same input.
MiniPrj 10	Different exact and approximation algorithms for Travelling-Sales-Person Problem
Group B: Machine Learning	
LA1	<p>Predict the price of the Uber ride from a given pickup point to the agreed drop-off location. Perform following tasks:</p> <ol style="list-style-type: none"> 1. Pre-process the dataset. 2. Identify outliers. 3. Check the correlation. 4. Implement linear regression and random forest regression models. <p>Evaluate the models and compare their respective scores like R2, RMSE, etc. Dataset link: https://www.kaggle.com/datasets/yasserh/uber-fares-dataset</p>
LA2	<p>Classify the email using the binary classification method. Email Spam detection has two states: a) Normal State – Not Spam, b) Abnormal State – Spam. Use K-Nearest Neighbors and Support Vector Machine for classification. Analyze their performance.</p> <p>Dataset link: The emails.csv dataset on the Kaggle https://www.kaggle.com/datasets/balaka18/email-spam-classification-dataset-csv</p>
LA3	<p>Given a bank customer, build a neural network-based classifier that can determine whether they will leave or not in the next 6 months.</p> <p>Dataset Description: The case study is from an open-source dataset from Kaggle. The dataset contains 10,000 sample points with 14 distinct features such as CustomerId, CreditScore, Geography, Gender, Age, Tenure, Balance, etc.</p> <p>Link to the Kaggle project: https://www.kaggle.com/barelydedicated/bank-customer-churn-modeling</p> <p>Perform following steps:</p> <ol style="list-style-type: none"> 1. Read the dataset. 2. Distinguish the feature and target set and divide the data set into training and test sets. 3. Normalize the train and test data. 4. Initialize and build the model. Identify the points of improvement and implement the same. <p>Print the accuracy score and confusion matrix (5 points).</p>



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LA4	Implement Gradient Descent Algorithm to find the local minima of a function. For example, find the local minima of the function $y=(x+3)^2$ starting from the point $x=2$.
LA5	Implement K-Nearest Neighbors algorithm on diabetes.csv dataset. Compute confusion matrix, accuracy, error rate, precision and recall on the given dataset. Dataset link : https://www.kaggle.com/datasets/abdallamahgoub/diabetes
LA6	Implement K-Means clustering/ hierarchical clustering on sales_data_sample.csv dataset. Determine the number of clusters using the elbow method. Dataset link : https://www.kaggle.com/datasets/kyanyoga/sample-sales-data
MiniPrj 7	Mini Project - Use the following dataset to analyze ups and downs in the market and predict future stock price returns based on Indian Market data from 2000 to 2020. Dataset Link: https://www.kaggle.com/datasets/sagara9595/stock-data
MiniPrj 8	Mini Project - Build a machine learning model that predicts the type of people who survived the Titanic shipwreck using passenger data (i.e. name, age, gender, socio-economic class, etc.). Dataset Link: https://www.kaggle.com/competitions/titanic/data
MiniPrj 9	Mini Project - Develop an application for signature identification by creating your own dataset of your college student
Group C: Blockchain Technology	
LA1	Installation of MetaMask and study spending Ether per transaction.
LA2	Create your own wallet using Metamask for crypto transactions.
LA3	Write a smart contract on a test network, for Bank account of a customer for following operations: <ul style="list-style-type: none"> • Deposit money • Withdraw Money Show balance
LA4	Write a program in solidity to create Student data. Use the following constructs: <ul style="list-style-type: none"> • Structures • Arrays • Fallback Deploy this as smart contract on Ethereum and Observe the transaction fee and Gas values.
LA5	Write a survey report on types of Blockchains and its real time use cases.
LA6	Write a program to create a Business Network using Hyperledger
MiniPrj 7	Mini Project - Develop a Blockchain based application dApp (de-centralized app) for e- voting system.



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MiniPrj 8	Mini Project - Develop a Blockchain based application for transparent and genuine charity
MiniPrj 9	Mini Project - Develop a Blockchain based application for health related medical records
MiniPrj 10	Mini Project - Develop a Blockchain based application for mental health

9.6 DIRECT ASSESMENT (100% Weightage)

Activities planned / assessment tools to be used to achieve Course Outcomes

Internal Assessment Tools (20% Weightage)

Sr. No.	Assessment Tool	Marks	Marks scale down to
1	Lab Assignments (LA1-LA6)	05 marks each	35
2	Mini Projects	15	45
3	Mock Practical(MP)	20 marks	20
Total			100

Rubrics for evaluation of Practical Assignment of 10 Marks Each.

Problem Solving Ability and logic	Basic Concept: Knowledge Understanding	Execution of assignment & Inference Drawn	On time Submission	Total
1	1	2	1	5

Rubrics for Evaluation of Mini Project

Planning of Project Work	Implementation	Technical Knowledge and Awareness related to the Project	Regularity and Attendance	Total
3	5	5	2	15



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Rubrics for Mock Practical		
Implementation	Oral+PR	Total
10	10	20

External Assessment Tools (80% Weightage)

Sr. No.	Assessment Tool	Marks scale down to
1	TW	50
2	Practical	50
Total		100



10. Name of the Course - Laboratory Practice IV(410247)

10.1 Course Structure

Weekly Workload (In Hrs)	Lecture	Tutorial	Practical
	-	-	2 Hrs/week

Midsem	Endsem	Practical	Oral	Term-work	Total Marks	Credit
-	-	-	-	50	50	1

10.2 Prerequisites for the course

1. 310244 : Computer Networks and Security
2. 310254 (A) : Information Security
3. Software Engineering(210245)

10.3 Companion Course (Supporting Theory Course)

1. Elective III(410244), Elective IV(410245)

10.4 Course Objectives

1. Learn android application development related to pervasive computing
2. Understand various multimedia file formats
3. Understand various vulnerabilities and use of various tools for assessment of vulnerabilities
4. Understand information retrieval process using standard tools available
5. Learn GPU programming and implementation of same using open source libraries
6. Learn installation and use of open source software testing tools

10.5 Course Outcomes

- At the end of the course, students will be able to,

CO No.	Year of study 2022-23	Mapping to POs/PSOs		
		Substantial	Moderate	Low
C410244(C).1	Apply android application development for solving real life problems	PO5	PO1,PO3,PO8,P O9,PO10,PO12	PO11
C410244(C).2	Design and develop system using various multimedia components	PO5	PO3,PO4,PO6, PO8,PO9,PO10	PO1,PO11



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C410244(C).3	Identify various vulnerabilities and demonstrate using various tools.	PO5	PO3,PO4,PO6, PO8,PO9,PO10, PO1, PO12	PO1
C410244(C).4	Apply information retrieval tools for natural language processing	PO5	PO3, PO8,PO9,PO10, PO11, PO12	PO1
C410244(C).5	Develop an application using open source GPU programming languages	PO5	PO3, PO8,PO9,PO10, PO11, PO12	PO1
C410244(C).6	Apply software testing tools to perform automated testing	PO5	PO3, PO8,PO9,PO10, PO11, PO12	PO1

10.6 List of Experiments/ Assignments:

Course CO No.	Assignment No.	Title of Experiments/ Assignments
C410244 (C).3	Lab Assignment 1 (LA1)	Write a program for Tracking Emails and Investigating Email Crimes. i.e. Write a program to analyze e-mail header
	LA2	Implement a program to generate and verify CAPTCHA image
	LA3	A person on a nearby road is trying to enter into a WiFi network by trying to crack the Password to use the IP Printer resource; write a program detect such attempt and prohibit the access. Develop the necessary scenario by Using an IEEE 802.11, configure a Wi-Fi adapter and Access Point
	LA4	Write a computer forensic application program for Recovering permanent Deleted Files and Deleted Partitions
	LA5	Write a program for Log Capturing and Event Correlation
	LA6	Configure and demonstrate use of vulnerability assessment tool like Wireshark or SNORT
	LA7	Study of Honeypot
	Mini Project	Design and develop a tool for digital forensic of images



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	Mini Project	Design and develop a tool for digital forensic of audio
	Mini Project	Design and develop a tool for digital forensic of video
	Mini Project	Design a system for the analysis of cyber crime using various cyber forensic techniques and compare each technique with respect to integrity, confidentiality, availability

Course CO No.	Assignment No.	Title of Experiments/ Assignments
C410244(C). 4	Lab Assignment 1 (LA1)	Draw state model for telephone line, with various activities.
	LA2	Draw basic class diagrams to identify and describe key concepts like classes, types in your system and their relationships.
	LA3	Draw one or more Use Case diagrams for capturing and representing requirements of the system. Use case diagrams must include template showing description and steps of the Use Case for various scenarios
	LA4	Draw one or more Use Case diagrams for capturing and representing requirements of the system. Use case diagrams must include template showing description and steps of the Use Case for various scenarios.
	LA5	Draw activity diagrams to display either business flows or like flow charts
	LA6	Draw component diagrams assuming that you will build your system reusing existing components along with a few new ones
	LA7	Draw deployment diagrams to model the runtime architecture of your system.
	Mini Project	Mini Project: Draw all UML diagrams for your project work.
	Mini Project	Mini Project - Develop a Blockchain based application for health related medical records Draw following UML Diagrams for Bank Management application a. Class Diagram b. Object Diagram c. ER Diagram d. Component Diagram



10.7 Internal Assessment Tools (20% Weightage)

Sr. No.	Assessment Tool	Total no. of experiment/ assignment	Total in number	Total Marks
1	Lab Assignments (LA1 to LA7)	07	35	35
2	Mini Project	04	80	80
3	Mock	07	35	35
Total				140

Rubrics for Lab Experiment/ Assignments (LA)

Implementation	Level of Understanding	On time Submission	Attendance
2	1	1	1

Rubrics for Mini Project (MP) (if applicable)

Implementation	Presentation	On time Submission
10	5	5

External Assessment Tools (80% Weightage)

Sr. No.	Assessment Tool	Marks
1	Practical / Oral	50
2	Term work	50
Total		100

11. Name of the Course – Project stage 1 (410248)

11.1 Course Structure

Weekly Workload (In Hrs)	Lecture	Tutorial	Practical
	-	-	2 Hrs/week

Midsem	Endsem	Practical	Oral	Term-work	Total Marks	Credit
-	-	-	-	50	50	2

11.2 Prerequisites of the Course

1. Different programming languages / tools.
2. Software engineering and Project Management.

11.3 Course Objectives

1. To Apply the knowledge for solving problem.
2. To Evaluate alternative approaches and justify the use of selected tools and methods.
3. To Consider relevant social, ethical and legal issues.
4. To find information for yourself from appropriate sources such as manuals, books, research journals and from other sources, and in turn increase analytical skills.
5. To Work in TEAM and learn professionalism.

11.4 Course Outcomes

CO No.	Year of study 2022-23	Mapping to POs/PSOs		
		Substantial	Moderate	Low
C408.1	Identify and formulate the problem.	1,2,12	6,7,8	4
C408.2	Analyze the problem scenario and propose solutions to engineering problem using software engineering principles.	2,3,5,13,14	4,8,11,12,15	6,7
C408.3	Prepare the SRS, plan and estimate the project cost as per proposed solution.	11	5,8,12	-
C408.4	Work as an individual and as a part of multidisciplinary team to design and develop quality project.	9	8,13,14,15	12
C408.5	Prepare report of proposed solution and communicate effectively through presentation.	9,14	5,8,10,12,15	-



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11.5 Internal Assessment Tools (20%)

Activities planned / assessment tools to be used to achieve Course Outcomes

Sr. No.	Assessment Tool	Total in number	Marks scale down to
1	Project Synopsis(PS)	01	15
2	Project Presentation(PP)*	03(Each 15 marks)	45
3	Partial Project Report(PPR)	01	40
Total			100

*Based on Reviews conducted as per guideline in Project Log Book given by SPPU.

External Assessment Tools (80% Weightage)

Sr. No.	Assessment Tool	Marks scale down to
1	Presentation (PRE)	50
Total		50



12. Name of the Course – Audit Course(410249)

12.1 Course Structure

Weekly Workload (In Hrs)	Lecture	Tutorial	Practical
	-	-	-

Midsem	Endsem	Practical	Oral	Term-work	Total Marks	Credit
-	-	-	-	-	-	-

12.2 Course Objectives

- To promote interactive user forums to support community interactions among students, professors, and experts
- To promote learn additional skills anytime and anywhere
- To enhance teaching and learning on campus and online

12.3 Course Outcomes

At the end of the course students will be able to -

CO No.	Year of Study 2022-2023	Mapping to POs / PSOs		
		Substantial	Moderate	Low
C409.1	To acquire additional knowledge and skill .	-	1,3	1,4

12.3 DIRECT ASSESMENT (100% Weightage)

Activities planned / assessment tools to be used to achieve Course Outcomes

Internal Assessment Tools (20% Weightage)

Sr. No.	Assessment Tool	Description
1.	Report	The student registered for audit course shall be awarded the grade AC and shall be included such AC grade in the Semester grade report for that course, provided <ul style="list-style-type: none"> • Student has the minimum attendance as prescribed by the Savitribai Phule Pune University and satisfactory in-semester performance and • Secured a passing grade in that audit course.
2.	Course Completion Certificate	

External Assessment Tools (80% Weightage)

Sr. No.	Assessment Tool	Marks scale down to
1	TW	AC
Total		AC