

Institute/Department	UNIVERSITY INSTITUTE OF ENGINEERING (UIE)	Program	Bachelor of Engineering (Artificial Intelligence and Data Science) (AI201)
Master Subject Coordinator Name:	Vinay Kumar	Master Subject Coordinator E-Code:	E19201
Course Name	Competitive Coding-II	Course Code	23CSP-378

Lecture	Tutorial	Practical	Self Study	Skilling	TC	TGT	TGP	Studio	Credit	Subject Type
0	0	4	0		0	0	0	0	2.00	P

Course Type	Course Category	Mode of Assessment	Mode of Delivery
Major Core	Graded (GR)	Practical Examination (PRAC)	Practical (PRAC)

Mission of the Department	<p>M1: To provide relevant, rigorous and contemporary curriculum and aligned assessment system to ensure effective learning outcomes for engineering technologies.</p> <p>M2: To provide platform for industry engagement aimed at providing hands-on training on advanced technological and business skills to our students.</p> <p>M3: To provide opportunities for collaborative, interdisciplinary and cutting-edge research aimed at developing solutions to real life problems.</p> <p>M4: To imbibe quest for innovation, continuous learning and zeal to pursue excellence through hard work and problem-solving approach.</p> <p>M5: To foster skills of leadership, management, communication, team spirit and strong professional ethics in all academic and societal endeavours of our students.</p>
Vision of the Department	To be recognized as a centre of excellence for Computer Science & Engineering education and research, through effective teaching practices, hands-on training on cutting edge computing technologies and excellence in innovation, for creating globally aware competent professionals with strong work ethics whom would be proficient in implementing modern technology solutions and shall have entrepreneurial zeal to solve problems of organizations and society at large.

Program Educational Objectives(PEOs)

PEO1	To be able to explore areas of research, technology application & innovation and make a positive impact in different types of institutional settings such as corporate entities, government bodies, NGOs, inter-government organizations, & start-ups.
PEO2	To be able to design, and implement technology and computing solutions to organizational problems, effectively deploy knowledge of engineering principles, demonstrate critical thinking skills & make the intellectual connections between quantitative and qualitative tools, theories, and context to solve the organizational problems
PEO3	To be able to work with, lead & engage big and small teams comprising diverse people in terms of gender, nationality, region, language, culture & beliefs. To understand stated and unstated differences of views, beliefs & customs in diverse & interdisciplinary team settings
PEO4	To be able to continuously learn and update one's knowledge, engage in lifelong learning habits and acquire latest knowledge to perform in current work settings
PEO5	To continuously strive for justice, ethics, equality, honesty, and integrity both in personal and professional pursuits. Able to understand and conduct in a way that is responsible and respectful.

Program Specific OutComes(PSOs)

PSO1	PSO1: Graduates will be able to analyze, design, and develop intelligent systems and applications by applying core concepts of Artificial Intelligence and Machine Learning across diverse domains.
PSO2	PSO2: Graduates will demonstrate proficiency in utilizing advanced AI/ML tools, frameworks, and technologies to innovate, implement, and manage projects in the rapidly evolving field of Artificial Intelligence and its allied application areas.
PSO3	PSO3: Graduates will apply AI, Machine Learning, and Data Analytics techniques to address real-world challenges, delivering effective and ethical solutions for industry, research, and societal needs.

Program OutComes(POs)

PO1	Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
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PO2	Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	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.
PO4	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.
PO5	Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitationsPO4 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.
PO6	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
PO7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.
PO11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context to technological change.
PO13	Demonstrate the capability to apply analytic thought to a body of knowledge, including the analysis and evaluation of policies, and practices. Identify relevant assumptions or implications, logical flaws and loopholes in the presented arguments
PO14	Demonstrate to create, perform, or think in different and diverse ways about the given scenario. Innovate and perform tasks in a better manner, view a problem or a situation from multiple perspectives, think 'out of the box' and generate solutions to complex problems in unfamiliar contexts
PO15	Demonstrate the ability to identify with or understand the perspective, experiences, or points of view of another individual or group, and to identify and understand other people's emotions
PO16	Demonstrate the ability to participate in community-engaged services/ activities for promoting the well-being of society
PO17	Demonstrate the acquisition of knowledge of the values and beliefs of multiple cultures, capability to effectively engage in a multicultural group/society and interact respectfully with diverse groups and gender sensitivity and adopting a gender-neutral approach, as also empathy for the less advantaged and the differently-abled including those with learning disabilities.

Text Books

Sr No	Title of the Book	Author Name	Volume/Edition	Publish Hours	Years
1	Guide to Competitive Programming	Antti Laaksonen	Third Edition	Springer	2024
2	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L.	Fourth Edition	The MIT Press	2022

Reference Books

Sr No	Title of the Book	Author Name	Volume/Edition	Publish Hours	Years
1	Competitive Programming	Steven Halim, Felix Halim, Suhendry Effendy	Fourth Edition	Lulu	2020
2	The Algorithm Design Manual	Steven S. Skiena	Third Edition	Springer	2020

Course OutCome

SrNo	OutCome
CO1	Demonstrate the use of fundamental Data Structures and the Java Collections Framework to effectively manage and manipulate complex data in competitive programming problems.

CO2	Construct and analyze advanced algorithmic techniques like Divide and Conquer and Dynamic Programming, ensuring optimal time and space complexity for contest-level problems.
CO3	Analyze and apply specialized data structures and algorithms, including those based on Binary Search and Bitwise Operations, to solve problems involving range queries and constrained optimization
CO4	Evaluate the efficiency of different algorithms and select the most appropriate structure and technique to solve challenging problems that require advanced data handling and optimization.
CO5	Design and implement highly optimized solutions for complex problems across various domains, including Graph Algorithms (e.g., shortest paths, connectivity) and Advanced Tree Structures, demonstrating

Lecture Plan Preview-Practical						
Unit No	ExperimentNo	Experiment Name	Text/ Reference Books	Pedagogical Tool**	Mapped with CO Number(s)	BT Level
1	1	Contains Duplicate II	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO1,CO2,CO5	BT3
1	2	Product of Array Except Self	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO1,CO2,CO5	BT4
1	3	Median of Two Sorted Arrays	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO1,CO2,CO5	BT5
1	4	Implement Queue using Stacks	,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3	BT3
1	5	Largest Rectangle in Histogram	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3	BT4
1	6	Minimum Number of Taps to Open to Water a Garden	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming	Hand On Activity based	CO2,CO3	BT4
1	7	Search Insert Position	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO1,CO2,CO3	BT3
1	8	Find Minimum in Rotated Sorted Array	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming	Hand On Activity based	CO1,CO2,CO3	BT4
1	9	Find the Duplicate Number	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO1,CO2,CO3	BT5
1	10	Add Digits	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3	BT3
1	11	Subsets	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3	BT6
1	12	Combination Sum	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3	BT6
2	13	Palindrome Linked List	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3	BT4
2	14	Rotate List	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3	BT3
2	15	Odd Even Linked List	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3	BT4

2	16	Inorder Successor	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3,CO4	BT5
2	17	Binary Tree Tilt	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3,CO4	BT4
2	18	Lowest Common Ancestor of a Binary Tree	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3,CO4	BT5
2	19	Binary Tree Inorder Traversal	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3,CO4,CO5	BT3
2	20	Two Sum IV - Input is a BST	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3,CO4,CO5	BT4
2	21	Find Mode in Binary Search Tree	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3,CO4,CO5	BT5
3	22	Longest Common Subsequence	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO3,CO4,CO5	BT4
3	23	Coin Change	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO3,CO4,CO5	BT5
3	24	Longest Increasing Subsequence	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO3,CO4,CO5	
3	25	Find if Path Exists in Graph	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO3,CO4,CO5	BT3
3	26	Shortest Path in Binary Matrix	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO3,CO4,CO5	BT4
3	27	Word Break	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO3,CO4,CO5	BT5
3	28	Single Number III	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3,CO4,CO5	BT4
3	29	Smallest Sufficient Team	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3,CO4,CO5	BT6
3	30	Range Sum Query – Mutable	,T-Guide to Competitive Programmi,T-Introduction to Algorithms,R-Competitive Programming ,R-The Algorithm Design Manual	Hand On Activity based	CO2,CO3,CO4,CO5	BT5

Assessment Model			
Sr No	Exam Name	Max Marks	Weighted Marks
1	External Viva / Voce	40	40

2	Experiment-1	30	4.5
3	Experiment-2	30	4.5
4	Experiment-3	30	4.5
5	Experiment-4	30	4.5
6	Experiment-5	30	4.5
7	Experiment-6	30	4.5
8	Experiment-7	30	4.5
9	Experiment-8	30	4.5
10	Experiment-9	30	4.5
11	Experiment-10	30	4.5
12	Mid-Term Test	15	15

CO vs PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	3	2	1	1	3	NA	NA	NA	NA	2	1	2	1	1	NA
CO2	3	3	2	2	3	NA	NA	NA	NA	1	NA	2	2	1	NA
CO3	3	1	3	2	3	NA	NA	NA	NA	1	NA	1	3	2	NA
CO4	1	3	2	3	3	NA	NA	NA	NA	1	NA	2	3	3	NA
CO5	3	2	3	3	3	NA	NA	2	1	2	1	2	3	NA	NA
Target	2.6	2.2	2.2	2.2	3	NA	NA	2	1	1.4	1	1.8	2.4	1.75	NA

PO16	PO17	PSO1	PSO2	PSO3
NA	NA	2	1	1
NA	NA	2	2	1
NA	NA	2	1	2
NA	NA	1	1	1
1	1	3	2	2
1	1	2	1.4	1.4

