LECTURE PLAN

Institute/Department	UNIVERSITY INSTITUTE OF ENGINEERING (UIE)	**Program**	**Bachelor of Engineering + Master of Engineering in Computer Science and Engineering (Hons) - Artificial Intelligence & Machine Learning in association with IBM (Integrated)(BI521)**
Master Subject Coordinator Name:	Prabhjot Kaur	**Master Subject Coordinator E-Code**:	**E16646**
Course Name	Artificial Intelligence	**Course Code**	**23CSH-378**

Lecture	Tutorial	Practical	Self Study	Skilling	TC	TGT	TGP	Studio	Credit	Subject Type
3	0	2	0		0	0	0	0	4.00	T

Course Type	Course Category	Mode of Assessment	Mode of Delivery
Major Elective	Graded (GR)	Hybrid	Hybrid (HYB)

Mission of the Department	M1: To provide relevant, rigorous and contemporary curriculum and aligned assessment system to ensure effective learning outcomes for engineering technologies. M2: To provide platform for industry engagement aimed at providing hands-on training on advanced technological and business skills to our students. M3: To provide opportunities for collaborative, interdisciplinary and cutting-edge research aimed at developing solutions to real life problems. M4: To imbibe quest for innovation, continuous learning and zeal to pursue excellence through hard work and problem-solving approach. M5: To foster skills of leadership, management, communication, team spirit and strong professional ethics in all academic and societal endeavours of our students.
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.
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 limitations.
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	Artificial Intelligence: A Modern Approach	Stuart Russell & Peter Norvig	4th Edition	Pearson	2020
2	Artificial Intelligence	Elaine Rich, Kevin Knight & Shivashankar B. Nair	3rd	McGraw Hill	2009
3	Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence	Kate Crawford	1st	Yale University Press	2021

Reference Books					
Sr No	Title of the Book	Author Name	Volume/Edition	Publish Hours	Years
1	Artificial Intelligence	Patrick Henry Winston	6th	Pearson	2002
2	Artificial Intelligence: Structures and Strategies for Complex Problem Solving	George F. Luger	6th	Pearson	2009
3	Introduction to Artificial Intelligence and Expert Systems	Dan W. Patterson	1st	Prentice Hall	1990

Course OutCome	
SrNo	OutCome
CO1	Recall the fundamental concepts of AI, including intelligent agents, problem-solving approaches, and search strategies.
CO2	Illustrate the various search techniques, including uninformed and heuristic-based methods, to solve AI-related problems.
CO3	Implement rule-based systems using forward and backward chaining for decision-making and learning.
CO4	Analyze and evaluate different knowledge representation techniques, logic programming, and reasoning methods in AI.
CO5	Design and implement uncertainty handling techniques, including probabilistic reasoning, fuzzy logic, and Bayesian networks.

Lecture Plan Preview-Theory

Unit No	LectureNo	ChapterName	Topic	Text/ Reference Books	Pedagogical Tool**	Mapped with CO Number(s)	BT Level
1	1	Introduction to AI	Definition, scope and history of AI	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO1	BT2
1	2	Introduction to AI	Intelligent Agents and environments	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Activity,PPT,Video Lecture	CO1	BT1
1	3	Introduction to AI	Rational agents and PEAS	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics,PPT,Video Lecture	CO1	BT1
1	4	Introduction to AI	Task Environments , Types of environments	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics,PPT,Video Lecture	CO1	BT2
1	5	Introduction to AI	Problem Solving Agents, Problem formulation	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics,PPT,Video Lecture	CO2	BT3
1	6	Search Strategies in AI	State space representation	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics,PPT,Video Lecture	CO2	BT4
1	7	Search Strategies in AI	Uninformed Search : BFS and DFS	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics,PPT,Video Lecture	CO2	BT3
1	8	Search Strategies in AI	Informed Search :Heuristic search, Hill Climbing ,Local search	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics,PPT,Video Lecture	CO2	BT3
1	9	Search Strategies in AI	A* Algorithm ,Best-first search, AO*	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics,PPT,Video Lecture	CO2	BT3
1	10	Search Strategies in AI	Problem Reduction , Divide and conquer in AI,CSP	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics,PPT,Video Lecture	CO2	BT4

1	11	Search Strategies in AI	AO* Algorithm , AND-OR graphs	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics, PPT,Video Lecture	CO2	BT3
1	12	Game Playing and Adversarial Search	Mini-Max Algorithm, Optimal Strategies for Game Playing	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics, PPT,Video Lecture	CO2	BT4
1	13	Game Playing and Adversarial Search	Alpha-Beta Pruning (Optimization of Mini-Max)	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics, PPT,Video Lecture	CO2	BT3
1	14	Game Playing and Adversarial Search	Move Ordering and Efficiency Improvements	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics, PPT,Video Lecture	CO2	BT3
1	15	Game Playing and Adversarial Search	Game Trees and State Representation, Real-World Applications of Game AI	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence	Infographics, PPT,Video Lecture	CO2	BT3
2	16	Knowledge Representation and Reasoning	Knowledge representation issues,Predicate Logic	,T-Artificial Intelligence,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO1	BT2
2	17	Knowledge Representation and Reasoning	Syntax and semantics.Logic Programming,Prolog concepts	,T-Artificial Intelligence,T-Artificial Intelligence: A Mod,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO3	BT4
2	18	Knowledge Representation and Reasoning	Semantic Nets,Network-based KR,Frames,Inheritance	,T-Artificial Intelligence,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO3	BT4
2	19	Knowledge Representation and Reasoning	Constraint reasoning, Propagation, Uncertainty	,T-Artificial Intelligence,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO3	BT4
2	20	Knowledge Representation and Reasoning	Probability basics,Bayesian Inference,Dempster-Shafer	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO2	BT3
2	21	Propositional & Predicate Logic	Propositional and First-Order Logic (FOL), Rule-Based Systems	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO3	BT4
2	22	Propositional & Predicate Logic	Expert Systems & Ontologies and Semantic Networks	,T-Artificial Intelligence,R-Introduction to Artificial Int	Infographics, PPT,Video Lecture	CO2	BT3
2	23	Propositional & Predicate Logic	Uncertainty in AI: Fuzzy Logic	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO2	BT3
2	24	Propositional & Predicate Logic	Uncertainty in AI: Bayesian Networks	,T-Artificial Intelligence,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO2	BT3
2	25	Propositional & Predicate Logic	First order logic. Inference in first order logic, propositional vs. first order inference	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO3	BT4
2	26	Rule-Based Systems and Learning	Representing knowledge using rules, Forward and Backward Chaining	,T-Artificial Intelligence,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO4	BT5
2	27	Rule-Based Systems and Learning	Rules based deduction systems, unification & lifts forward chaining	,T-Artificial Intelligence,R-Introduction to Artificial Int	Infographics, PPT,Video Lecture	CO3	BT4
2	28	Rule-Based Systems and Learning	Backward chaining, Resolution, Learning from observation Inductive learning	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO3	BT4

2	29	Rule-Based Systems and Learning	Decision trees, Explanation based learning	,T-Artificial Intelligence,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO3	BT4
2	30	Rule-Based Systems and Learning	Statistical Learning methods, Reinforcement Learning	,T-Atlas of AI: Power, Politics, ,R-Introduction to Artificial Int	Infographics, PPT,Video Lecture	CO3	BT4
3	31	Expert systems	Introduction, Difference between expert system	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO1	BT2
3	32	Expert systems	Conventional programs, Expert system organization	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO1	BT2
3	33	Expert systems	Expert system Architecture	,T-Artificial Intelligence,R-Introduction to Artificial Int	Infographics, PPT,Video Lecture	CO2	BT3
3	34	Expert systems	Knowledge representation & acquisition techniques	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO4	BT4
3	35	Expert systems	Inference Engine& Explanation systems.	,T-Artificial Intelligence,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO2	BT3
3	36	Planning	Classical planning	,T-Artificial Intelligence,R-Introduction to Artificial Int	Infographics, PPT,Video Lecture	CO1	BT2
3	37	Planning	Algorithms	,T-Artificial Intelligence: A Mod,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO3	BT3
3	38	Planning	Approaches	,T-Artificial Intelligence,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO3	BT3
3	39	Planning	Planning and acting in real world	,T-Artificial Intelligence,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO2	BT4
3	40	AI in Robotics and Computer Vision	Overview of Path Planning and Obstacle Avoidance	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO2	BT3
3	41	AI in Robotics and Computer Vision	Overview of Path Planning and Obstacle Avoidance	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO2	BT3
3	42	AI in Robotics and Computer Vision	Object Detection and Recognition using OpenCV	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO1	BT2
3	43	AI in Robotics and Computer Vision	Object Detection and Recognition using OpenCV	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO1	BT2
3	44	AI in Robotics and Computer Vision	Simultaneous Localization and Mapping (SLAM)	,T-Atlas of AI: Power, Politics, ,R-Introduction to Artificial Int	Infographics, PPT,Video Lecture	CO2	BT4
3	45	AI in Robotics and Computer Vision	Simultaneous Localization and Mapping (SLAM)	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Infographics, PPT,Video Lecture	CO2	BT4

Lecture Plan Preview-Practical

Unit No	ExperimentNo	Experiment Name	Text/ Reference Books	Pedagogical Tool**	Mapped with CO Number(s)	BT Level
1	1	a. Solve the Water Jug Problem using DFS, BFS blind search algorithms using Python b. Build a GUI tool that solves any two-jug water problem using DFS, BFS and shows the state-space graph and a step-by-step solution animation.	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Instructor Lead WorkShop,Simulation	CO2,CO4	BT3,BT6
1	2	a. Implement Mini-max adversarial search algorithm using Python. b. Build a playable Tic-Tac-Toe (or simplified Connect-4) where the computer uses minimax with optional alpha–beta pruning; include difficulty levels.	,T-Atlas of AI: Power, Politics, ,R-Introduction to Artificial Int	Activity,Instructor Lead WorkShop,Reports, Simulation	CO3,CO5	BT3,BT6
1	3	A. Implement the optimal path between two cities using best first search and A* heuristic algorithms using Python. Build a Small map-based route planner between cities (or grid map) implementing Best-First and A*; visualise map and path.	,T-Atlas of AI: Power, Politics, ,R-Introduction to Artificial Int	Activity,Flipped Classes,Instructor Lead WorkShop,Reports, Simulation	CO3,CO5	BT3,BT4, BT6
1	4	A. Implement the Missionaries and cannibals problem using constraint satisfaction method B. Build a CSP solver that models constraints and finds solutions using backtracking + forward checking; include step visualization.	,T-Atlas of AI: Power, Politics, ,R-Introduction to Artificial Int	Activity,Instructor Lead WorkShop,Reports, Simulation	CO2,CO4	BT3,BT4, BT6

2	5	A. Represent knowledge using Propositional Logic and perform inference B. Build a small propositional logic system: parse CNF sentences, run forward/backward chaining and DPLL SAT solver to answer queries.	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc,R-Introduction to Artificial Int	Activity,Case Study,Instructor Lead WorkShop,Reports, Simulation	CO3	BT3,BT4, BT6
2	6	A. Case study: Autonomous Vehicles B. Practice a mini CV pipeline that detects lanes and computes steering angle from dashcam images/video; package as a report + demo script.	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Case Study,Instructor Lead WorkShop,Simulation	CO4	BT3,BT4
2	7	A. Case study: Autonomous Vehicles B. Practice a mini CV pipeline that detects lanes and computes steering angle from dashcam images/video; package as a report + demo script.	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Instructor Lead WorkShop,Simulation,Video Lecture	CO4,CO5	BT3,BT4, BT6
3	8	Building a Rule-Based Expert System for Disease Diagnosis Using Python.	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Instructor Lead WorkShop,PPT,Simulation	CO3,CO5	BT5,BT6
3	9	Real-Time Object Detection using OpenCV and Haar Cascades (Use Haar cascades or YOLO for object detection in real-time images or videos.	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence: Struc	Instructor Lead WorkShop,PPT,Video Lecture	CO5	BT4,BT6
3	10	Implementing a SLAM using OpenCV and ORB Feature Detection in AI	,T-Atlas of AI: Power, Politics, ,R-Artificial Intelligence	Instructor Lead WorkShop,PPT,Video Lecture	CO5	BT4,BT6

Assessment Model			
Sr No	Exam Name	Max Marks	Weighted Marks
1	Practical Evaluations	40	20
2	End Term Hybrid Theory	60	30
3	Attendance Marks	2	2
4	Surprise Test	12	4
5	Practical MST	10	4

6	Practical Worksheet/Projects 1	30	2
7	Practical Worksheet/Projects 2	30	2
8	Practical Worksheet/Projects 3	30	2
9	Practical Worksheet/Projects 4	30	2
10	Practical Worksheet/Projects 5	30	2
11	Practical Worksheet/Projects 6	30	2
12	Practical Worksheet/Projects 7	30	2
13	Practical Worksheet/Projects 8	30	2
14	Practical Worksheet/Projects 9	30	2
15	Practical Worksheet/Projects 10	30	2
16	Quiz	4	4
17	Assignment/PBL	10	6
18	MST-1 Hybrid	20	5
19	MST-2 Hybrid	20	5