Artificial Intelligence	Code & No:	CS 320
	Credits:	3(3,1,0)
	Pre-requisite:	MATH 111
	Co-requisite:	None
	Level:	7

Course Description:

This course will serve as an introduction to artificial intelligence concepts and techniques. Specific topics we will cover include the history and philosophy of AI, the agent paradigm in AI systems, search, game playing, knowledge representation and reasoning, logical reasoning, uncertain reasoning and Bayes nets, planning, and machine learning.

Topics to be Covered:

1) Artificial Intelligence
2) Problem-Solving by searching
3) Informed search and Exploration
4) Constraint programming
5) Games
6) Knowledge representation and reasoning
7) Logical agent
8) Fist Order Logic
9) Inference
10) Knowledge representation
11) Neural network
12) Constraint programming
13) Machine Learning
14) Planning
15) Present and Future of AI

Course Aims:

1) Broad introduction to the foundational principles of artificial intelligence
2) Providing students techniques to develop, maintain, and utilize intelligent systems in many life applications.
3) Developing creative capacities for the design, implementation, and analysis of computer programs that reason and/or act intelligently
4) Learning to analyze and experimentally evaluate designs and implementations of the intelligent computer programs

Student Outcomes (SOs):

☒(a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline

☒(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

☒(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

☒(d) An ability to function effectively on teams to accomplish a common goal

☐(e) An understanding of professional, ethical, legal, security and social issues and responsibilities

☐(f) An ability to communicate effectively with a range of audiences

☐(g) An ability to analyze the local and global impact of computing on individuals, organizations, and society

☐(h) Recognition of the need for and an ability to engage in continuing professional development

☒(i) An ability to use current techniques, skills, and tools necessary for computing practice.

☐(j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices. [CS]

☐(k) An ability to apply design and development principles in the construction of software systems of varying complexity. [CS]

☐(j) An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking, and web systems and technologies. [IT]

☐(k) An ability to identify and analyze user needs and take them into account in the selection, creation, evaluation, and administration of computer-based systems. [IT]

☐(l) An ability to effectively integrate IT-based solutions into the user environment. [IT]

☐(m) An understanding of best practices and standards and their application. [IT]

☐(n) An ability to assist in the creation of an effective project plan. [IT]

Course Learning Outcomes (CLOs):

1. Understand different types of AI agents
2. Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms)
3. Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving

4. Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information
5. Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems

SOs and CLOs Mapping:

CLO/SO	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CLO1	√		√											
CLO2		√	√											
CLO3		√	√											
CLO4				√					√					
CLO5	√								√					

No.	Topics	Weeks	Teaching hours
1	Introduction: Definitions, History of AI	2	6
2	Intelligent Agents	1	3
3	Problem Solving by Searching	1	3
4	Informed Search and Exploration	2	6
5	Constraint Programming	1	3
6	Knowledge Representation & Reasoning	1	3
7	Inference	2	6
8	Machine Learning	3	9
9	Present and Future of AI	1	3
	Total	**14**	**42**

Textbook:

- S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 3rd edition, Prentice Hall, 2012, ISBN-13: 860-1419506989

Essential references:

- Russell, I., Coleman, S., Markov, Z. 2012. A Contextualized Project-based Approach for Improving Student Engagement and Learning in AI Courses. *Proceedings of CSERC 2012 Conference*, ACM Press, New York, NY, 9-15, DOI= http://doi.acm.org/10.1145/2421277.242127
- Russell, I., Markov, Z., Neller, T., Coleman, S. 2010. MLeXAI: A Project-Based Application Oriented Model, *ACM Transactions on Computing Education*, 20(1), pages 17-36.