ISLAMIC UNIVERSITY OF TECHNOLOGY

Course Outline and Course Plan

Name of the Teacher	**Md. Bakhtiar Hasan**	**Position**	**Lecturer**
Department	**CSE**	**Program**	**B.Sc. Engineering in CSE**
Course Code	**CSE 4711**	**Course Title**	**Artificial Intelligence**
Academic Year	**2021-22**	**Semester**	**Winter**
Contact Hours	**3.00**	**Credit Hours**	**3.00**
Textbooks and Reference books	**1. Artificial Intelligence: A Modern Approach (3rd Edition) 2. Reinforcement Learning: An Introduction (2nd Edition) 3. Artificial Intelligence: Foundations of Computational Agents**	**Author of the Books**	**1. Stuart Russell and Peter Norvig (R&N) 2. Richard S. Sutton and Andrew Barto (S&B) 3. David L. Poole and Alan K. Mackworth**
Prerequisites	**A firm grasp on Python Programming Language, Data Structures, Discrete Mathematics, Algorithms, Probability**	**Curriculum Requirement**	**Compulsory**
Course Homepage	**Google Classroom Code: 77bvgjj**		
Teaching Methods/ Approaches	**Lecture Demonstration Problem Solving**		
Teaching Aids	**Multimedia and OHP Board and Marker**		

Course Assessment Method						
Attendance (10%)	**Quiz/Viva (30%) (Best 3 out of 4)**				**Mid Exam (25%)**	**Final Exam (35%)**
Throughout	**1st Quiz**	**2nd Quiz**	**3rd Quiz**	**4th Quiz**	**Week/Date**	**Week/Date**

the Semester	**Week/ Date**	**Week/ Date**	**Week/ Date**	**Week/ Date**		
	3rd Week	**6th Week**	**10th Week**	**13th Week**	**8th Week**	**16th Week**

Course Contents and Objectives	**Contents** History, Intelligent agents, Uninformed search, Informed search, Constraint satisfaction, Game-playing, Logical agents, Propositional logic, First-order logic, Inference in first-order logic, Resolution, Logic programming, Planning, Plan execution, Uncertainty, Probability theory, Probabilistic inference, Bayesian networks and associated inference algorithms, Optimal decisions under uncertainty, optimal sequential decisions, Markov decision processes, Learning agents, Inductive learning, Decision trees. **Objectives** Introduce the wide range of topics studied in artificial intelligence, with emphasis on the "core competencies" of intelligent systems - problem-solving, reasoning, decision making, and learning - and on the logical and probabilistic foundations of these activities.
Course Outcomes	**CO1 - Apply** general artificial intelligence techniques for common problem types **(C3)** **CO2 - Examine** various problem scenarios to model environments and agents **(C4)** **CO3 - Recommend** solutions to real-life artificial intelligence problems analyzing the existing technique **(C5)**

Weekly Plan for Course Content		
Weeks	**Topics**	**Task/Reading**
1	Introduction	**R&N:** 1, 2
2	Search	**R&N:** 3.1-3.6
3		
4	Constraint Satisfaction Problems	**R&N:** 6.1-6.5
5		
6	Game Trees	**R&N:** 5.2-5.5, 16.1-16.3
7		
8	Markov Decision Process	**R&N:** 17.1-17.3 **S&B:** 3-4
9		

10 11	Reinforcement Learning	**R&N:** 21 **S&B:** 6.1, 6.2, 6.5
12 13	Probability and Bayesian Nets	**R&N:** 13.1–13.5, 14.1–14.5
14	Decision Networks	**R&N:** 16.5, 16.6

Mapping of Course Outcomes (COs) and Program Outcomes (POs) and Evaluation Methods				
Assessment Method	**Marks**	**Mark Distributions (as %) on COs and POs**		
		CO1	**CO2**	**CO3**
		PO 1	**PO 4**	**PO 2, PO 3**
Attendance (Class Participation)	**10%**			
Quiz 1/Quiz 2/Quiz 3/Quiz 4	**30%**			
Mid Semester Exam	**25%**			
Final Exam	**35%**			
Total	**100%**			

Mapping of COs and POs												
Course Outcomes	**Program Outcomes (POs)**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	✓											
CO2				✓								
CO3		✓	✓									

Program Outcomes (POs)	
Students graduating from the Bachelor of Science in Computer Science and Engineering (B. Sc. in CSE) program, upon graduation, will have the ability to:	
PO 1	**Engineering Knowledge** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem Analysis** Identify, formulate, research, and analyze complex engineering problems and reach substantiated conclusions using the principles of mathematics, the natural

	sciences, and the engineering sciences.
PO 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 public health and safety and of cultural, societal, and environmental concerns.
PO 4	**Investigation** Conduct investigations of complex problems, considering experimental design, data analysis, and interpretation, and information synthesis to provide valid conclusions.
PO 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 their limitations.
PO 6	**The Engineer and Society** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	**Environment and Sustainability** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
PO 8	**Ethics** Apply ethical principles and commit to the professional ethics, responsibilities and norms of the engineering practice.
PO 9	**Individual Work and Teamwork** Function effectively as an individual and as a member or leader of diverse teams and in multidisciplinary settings.
PO 10	**Communication** Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.
PO 11	**Project Management and Finance** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's work as a team member or a leader to manage projects in multidisciplinary environments.
PO 12	**Life-Long Learning** Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

K

Table: Knowledge Profile	
Attribute	
K1	A systematic, theory-based understanding of the natural sciences applicable to the discipline
K2	Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline
K3	A systemic, theory-based formulation of engineering fundamentals required in the engineering discipline
K4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
K5	Knowledge that supports engineering design in a practice area
K6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
K7	Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability
K8	Engagement with selected knowledge in the research literature of the discipline

P

Table: Range of Complex Engineering Problem Solving	
Attribute	Complex Engineering Problems have characteristic P1 and some or all of P2 to P7
Depth of knowledge required	P1: Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6, or K8 which allows a fundamentals-based, first principles analytical approach
Range of conflicting requirements	P2: Involve wide-ranging or conflicting technical, engineering and other issues
Depth of analysis required	P3: Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models
Familiarity of issues	P4: Involve infrequently encountered issues
Extent of applicable codes	P5: Are outside problems encompassed by standards and codes of practice for professional engineering
Extent of stakeholder involvement and	P6: Involve diverse groups of stakeholders with widely varying needs.

conflicting requirements	
Interdependence	P7: Are high-level problems including many component parts or sub-problems

A

Table: Range of Complex Engineering Activities	
Attribute	Complex activities means (engineering) activities or projects that have some or all of the following characteristics:
Range of resources	A1: Involve the use of diverse resources (and for this purpose resources include people, money, equipment, materials, information and technologies)
Level of interaction	A2: Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
Innovation	A3: Involve creative use of engineering principles and research-based knowledge in novel ways
Consequences for society and the environment	A4: Involve creative use of engineering principles and research-based knowledge in novel ways
Familiarity	A5: Can extend beyond previous experiences by applying principles-based approaches

Grading Policy		
Numeric Grade	**Letter Grade**	**Grade Point**
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00

Class Schedule		
Day	**Section 1**	**Section 2**
Monday	11:45 a.m.	10:30 a.m.
Wednesday	08:00 a.m.	11:45 a.m.

Student Consulting Hour:

- Thursday, 10:30 a.m. – 11:30 a.m. (on request)

Instruction Contact Details:

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