University of Asia Pacific (UAP)
Department of CSE

CSE 403 Course Outline

Program: Bachelor of Science in CSE

Course Title: Artificial Intelligence and Expert Systems

Course Code: CSE 403

Semester: Fall 20

Level: 4th year, 1st Semester (4-1)

Credit Hour: 3.0

Name & Designation of Teacher: Dr. Nasima Begum, Assistant Professor

Office/Room:

Class Hours: Sunday: 9:30AM – 10:50AM (Section A)
Tuesday: 9:30AM – 10:50AM (Section A)
Tuesday: 11:00AM – 12:20PM (Section B)
Thursday: 9:30AM – 10:50AM (Section B)

Consultation Hours: Wednesday: 12:30PM – 1:50PM (Section A)
Thursday: 11:0AM – 12:20PM (Section B)

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Rationale: Required course to Pattern Recognition in the CSE program. This knowledge is very important for the field of Pattern Recognition and Machine Learning professional.

Pre-requisite (if any)**: CSE 205, CSE 207**

Course Synopsis: Introduction, Definition, Foundation, **Agent:** Characteristics, Environments, Agent Types, **First Order Logic:** Basic Elements, Quantifiers, Proof Tree, Forward Chaining, Backward Chaining, Resolution, **Searching: Uninformed Search:** Breadth-First Search (BFS), Depth-First Search (DFS), Uniform-Cost Search (UCS), Depth-Limited Search (DLS), Iterative Deepening Search (IDS), Bi-Directional Search (BDS), **Informed Search:** Greedy Best-First Search, A* Search, Memory Bounded Heuristic Search, **Local Search:** Hill-Climbing Search, Simulated Annealing, Local Beam Search, Genetic Algorithm, **Game Playing:** Game Definition, Game Theory, Zero Sum Game, Minimax Algorithm, AlphaBeta Pruning, **Planning and Acting:** Action Schema, Preconditions and Effects, PDDL Description, **Uncertainty and Reasoning:** Rational Decision, Probability Theory, Utility Theory, Decision Theory, Bayes' Rule, **Decision Making:** Axioms of Utility Theory, Allais Paradox, Ellsberg

Paradox, **Learning:** Factors, Components, Types, Unsupervised Learning, Supervised Learning, Semi-supervised Learning, Deductive Learning, Inductive Learning, Reinforcement Learning.

Course Objectives: The objectives of this course are to:

1. Provide the fundamental knowledge of AI, history, success, achievement, inferencing, introduction to intelligent agent, different types of agent, expert system, and knowledge representation technique and analyze them in various practical scenarios.

2. Explain various AI search techniques (uninformed, informed, Genetic algorithm) and game theory for different real life problems.

3. Demonstrate different probabilistic reasoning technique (Markov Model, Bayesian Rule, Fuzzy system) for various cases.

4. Explain different advanced AI topics (Artificial Neural Network (ANN), Natural Language Processing (NLP) and different learning technique (supervised, unsupervised, reinforcement) to build AI agents.

Course Outcomes (CO) and their mapping with Program outcomes (PO) and Teaching-Learning Assessment methods:

CO No.	CO Statements: Upon successful completion of the course, students should be able to:	Corresponding POs (Appendix-1)	Bloom's taxonomy domain/level (Appendix-2)	Delivery methods and activities	Assessment Tools
CO1	**Understand** the fundamental concepts of AI and Intelligent Agent in various practical scenarios.	2	1/Understand	Lecture, Multimedia, Problem solving	Quiz, Problem solving, Written exam, Mid Exam
CO2	**Explain** various AI search techniques and Game Theory for different real life problems.	4	1/Analyze	Lecture, Multimedia, Problem Solving,	Quiz, Presentation Mid Exam
CO3	**Apply** different knowledge representation & reasoning (KRR) techniques and Fuzzy Logic in different scenarios.	1	1/Apply	Lecture, Multimedia, Group Discussion, Problem solving	Assignment, Problem solving, Final Exam
CO4	**Interpret** Markov Model, Bayesian Rule in uncertainty and probabilistic reasoning.	3	1/Analyze	Lecture, Problem Solving, Group	Assignment, Problem solving, Final Exam

					discussion	
CO5	**Analysis and Design** AI agents based on ANN, different types of Learning techniques and NLP systems.	3	1/Evaluate	Lecture, Multimedia, Problem solving	Case study, assignment, project

Weighting COs with Assessment methods:

Assessment Type	% Weight	CO1	CO2	CO3	CO4	CO5
Final Exam	**Written (40%)**		20		10	10
	Viva (10%)			10		
Mid Term	**20%**	8.33	11.67			
Quizzes, Assignment	**30%**	5	10	10	5	
Total	**100%**	13.33	41.67	20	15	10

Grading Policy: As per the approved grading policy of UAP (Appendix-3)

Course Content Outline and mapping with COs

AIMA = Artificial Intelligence: A Modern Approach

Weeks	Topics / Content	Course Outcome	Delivery methods and activities	Reading Materials
1	Introduction to AI	CO1	Lecture, multimedia	Relevant chapter of both Book, Lecture Slide, Handout
2	Intelligent Agent	CO1	Lecture, multimedia	Relevant chapter of Book-AIMA, Lecture Slide, Handout
2	Intelligent Agent	CO1	Lecture, multimedia	Relevant chapter of Book-AIMA, Lecture Slide, Handout
3	Uninformed Search (BFS, DFS, UCS)	CO2	Lecture, multimedia, Case study	Relevant chapter of Book-AIMA, Lecture Slide

4	Uninformed Search (BFS, DFS, UCS)	CO2	Lecture, multimedia, Case study	Relevant chapter of Book-AIMA, Lecture Slide
4	Uninformed Search (BFS, DFS, UCS)	CO2	Lecture, multimedia, Case study	Relevant chapter of Book-AIMA, Lecture Slide
5	Uninformed Search (BFS, DFS, UCS)	CO2	Lecture, multimedia, Case study	Relevant chapter of Book-AIMA, Lecture Slide
5	Informed Search (Best-First, Greedy Best-First)	CO2	Lecture, multimedia, Case study	Relevant chapter of Book-AIMA, Lecture Slide
6	Informed Search (A*, Heuristics)	CO2	Lecture, multimedia, Case study	Relevant chapter of Book-AIMA, Lecture Slide
7	Informed Search (A*, Heuristics)	CO2	Lecture, multimedia, Case study	Relevant chapter of Book-AIMA, Lecture Slide
8	Local Search, Genetic Algorithm	CO2	Lecture, multimedia,, problem solving	Relevant chapter of Book-AIMA, Lecture Slide
9	Adversarial Search, Game Theory	CO2	Lecture, multimedia,, problem solving	Relevant chapter of Book-AIMA, Lecture Slide
10	Adversarial Search, Game Theory	CO2	Lecture, multimedia,, problem solving	Relevant chapter of Book-AIMA, Lecture Slide
10	Adversarial Search, Game Theory	CO2	Lecture, multimedia,, problem solving	Relevant chapter of Book-AIMA, Lecture Slide
11	Propositional Logic, Prolog	CO3	Lecture, multimedia	Relevant chapter of both Book, Lecture Slide, Handout
11	Predicate Logic, Semantic Net	CO3	Lecture, multimedia	Relevant chapter of both Book, Slide, Handout
12	Understand probabilistic reasoning, Interpret Bayesian Rule	CO4	Lecture, multimedia, problem solving	Book-AIMA, Lecture Slide

12	Explain the basics of Markov Model	CO4	Lecture, multimedia, problem solving	Book-AIMA, Lecture Slide
13	Explain the basics of Fuzzy System	CO4	Lecture, multimedia, problem solving	Handout, Relevant chapter of both Book, Lecture Slide,
13	Introduction to Artificial Neural Networks and different Learning techniques	CO5	Lecture, multimedia, problem solving	Handout, Relevant chapter of both Book, Lecture Slide,
14	Introduction multilayer Neural Networks and different problems	CO5	Lecture, multimedia, problem solving	Handout, Relevant chapter of both Book, Lecture Slide,
15	Review	CO1- CO5	All Lectures	Book-AIMA, All Lecture Slides

TextBook: AIMA = Artificial Intelligence: A Modern Approach-by Stuart Russell and Peter Norving (3rd / 4th Edition)

Recommended Reference(s): Artificial Intelligence-by Patrick Henry Winston (3rd Edition)

Other References: http://ai.berkeley.edu/lecture_slides.html

Special Instructions:
- Minimum Required Attendance: 60% class attendance is mandatory for a student in order to appear at the final examination.
- Absent in the class: If a lecture is missed by a student, consultancy hours and office hours can be used to understand those topics.
- Late presence: Punctuality is essential, DON'T be late.
- Assignment submission rules: Students must submit their assignments on time. No late or partial assignments will be acceptable.
- There will be no make-up quizzes.
- Manners and etiquettes!
- Plagiarism policy: Copied assignments will be negative marking.

Online Etiquette for Students

- Prepare yourself for the class. Remember that it is a classroom setting, consisting of all learners' classmates and teachers. Students need to follow all the etiquettes they would in a regular classroom.
- Make sure your device is ready at least 10 minutes before the class starts.
- Make sure all required study materials such as pen, paper, books, etc. are in your reach during the class
- Try to be alone and pay full attention to your teachers. Nobody should be around you while the class is in progress (if not possible, take extra care to keep your microphone in mute state to avoid extra noise during the class).
- Follow the timetable of the class very strictly
- Keep your microphone in mute state and video in on state. If you need to communicate with your teacher raise your hands and seek permission.
- Do not do anything which may disturb the class (such as passing irrelevant and negative comments etc.); you will be monitored and **disciplinary actions will be taken.**

Prepared by	Checked by	Approved by
Dr. Nasima Begum	Chairman, PSAC committee	Head of the Department

Appendix-1:
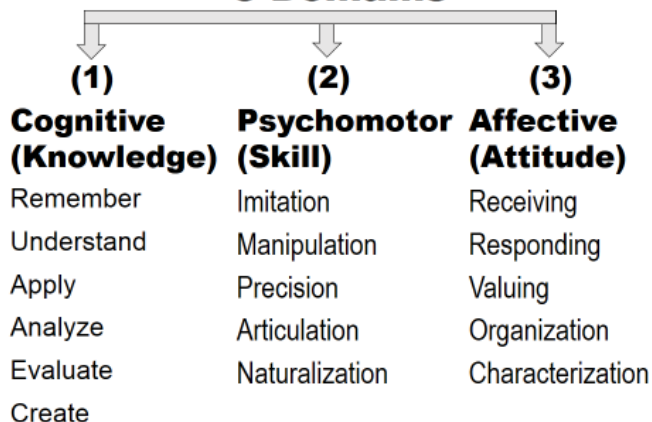**Washington Accord Program Outcomes (PO) for engineering programs:**

No.	PO	Differentiating Characteristic
1	Engineering Knowledge	Breadth and depth of education and type of knowledge, both theoretical and practical
2	Problem Analysis	Complexity of analysis
3	Design/ development of solutions	Breadth and uniqueness of engineering problems i.e. the extent to which problems are original and to which solutions have previously been identified or codified
4	Investigation	Breadth and depth of investigation and experimentation
5	Modern Tool Usage	Level of understanding of the appropriateness of the tool
6	The Engineer and Society	Level of knowledge and responsibility
7	Environment and Sustainability	Type of solutions.
8	Ethics	Understanding and level of practice
9	Individual and Team work	Role in and diversity of team
10	Communication	Level of communication according to type of activities performed

| 11 | Project Management and Finance | Level of management required for differing types of activity |
| 12 | Lifelong learning | Preparation for and depth of Continuing learning. |

Appendix-2

Bloom's Taxonomy (Taxonomy of Learning)
3 Domains

(1) Cognitive (Knowledge)	(2) Psychomotor (Skill)	(3) Affective (Attitude)
Remember	Imitation	Receiving
Understand	Manipulation	Responding
Apply	Precision	Valuing
Analyze	Articulation	Organization
Evaluate	Naturalization	Characterization
Create		

Appendix-3

UAP 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