…….211-+COURSE DESCRIPTION FORM: CS-461 Artificial Intelligence (AI)

COURSE DESCRIPTION FORM

INSTITUTION FAST School of Computing, National University of Computer and Emerging Sciences, Islamabad

PROGRAM TO BE EVALUATED	BS-AI/CS – **Spring 2021**

Course Description

Course Code	CS-461
Course Title	Artificial Intelligence
Credit Hours	3+1
Prerequisites by Course(s) and Topics	Programming Fundamentals.
Grading Policy	Absolute grading
Policy about missed assessment items in the course	Retake of missed assessment items (other than midterm/ final exam) will not be held. For a missed midterm/ final exam, an exam re-take/ pre-take application along with necessary evidence are required to be submitted to the department secretary. The examination assessment and retake committee will decide the exam re-take/ pre-take cases.
Course Plagiarism Policy	Plagiarism in project or midterm/ final exam may result in F grade in the course. Plagiarism in an assignment will result in zero marks in the whole assignments category.
Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	***75% Theory 25% Practical*** Assessment Items

Assessment Item	**Number**	**Weight (%)**
Assignments	4	15
Midterm Exam	2	25 (10+15)
Project (Lab)	1	10
Final Exam	1	50

Course Instructors	Dr. Rauf Ahmed Shams Malick
Lab Instructors (if any)	
Course Coordinator	
URL (if any)	
Current Catalog Description	This course introduces students to the basic knowledge representation, problem solving, and learning methods of artificial intelligence. Upon completion, students should be able to develop intelligent systems by assembling solutions to concrete computational problems;

	understand the role of knowledge representation, problem solving, and learning in intelligent-system engineering; and appreciate the role of problem solving, vision, and language in understanding human intelligence from a computational perspective.
Textbook (or **Laboratory Manual** for Laboratory Courses)	1. Stuart Russell and Peter Norvig, Artificial Intelligence. A Modern Approach, 3rd edition, Prentice Hall, Inc., 2010.
Reference Material	

Course Learning Outcomes

A. Course Learning Outcomes (CLOs)

On successful completion of this course students will have to know how of:

1. Understand the notions of rational behavior and intelligent agents.
2. Develop a general appreciation of the goals, sub-areas, achievements and difficulties of AI.
3. Knowledge of methods of blind as well as informed search and ability to practically apply the corresponding techniques.
4. General understanding of major concepts, approaches and research in knowledge representation, planning, learning, robotics and other AI areas.
5. Developing programming skills for AI applications.

B. Program Learning Outcomes

For each attribute below, indicate whether this attribute is covered in this course or not. Leave the cell blank if the enablement is little or non-existent.

1. Computing Knowledge	Apply knowledge of mathematics, natural sciences, computing fundamentals, and a computing specialization to the solution of complex computing problems.	✔
2. Problem Analysis	Identify, formulate, research literature, and analyze complex computing problems, reaching substantiated conclusions using first principles of mathematics, natural sciences, and computing sciences.	✔
3. Design/ Develop Solutions	Design solutions for complex computing problems and design systems, components, and processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.	✔
4. Investigation & Experimentation	Conduct investigation of complex computing problems using research-based knowledge and research based methods.	✔
5. Modern Tool Usage	Create, select, and apply appropriate techniques, resources and modern computing tools, including prediction and modeling for complex computing problems.	✔
6. Society Responsibility	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues relevant to context of complex computing problems.	
7. Environment and Sustainability	Understand and evaluate sustainability and impact of professional computing work in the solution of complex computing problems.	
8. Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of computing practice.	
9. Individual and Team Work	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.	✔
10. Communication	Communicate effectively on complex computing activities with the computing community and with	

	society at large.	
11. Project Management and Finance	Demonstrate knowledge and understanding of management principles and economic decision making and apply these to one's own work as a member or a team.	
12. Life Long Learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.	✔

C. Mapping of CLOs on PLOs
(CLO: Course Learning Outcome, PLOs: Program Learning Outcomes

		PLOs											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CLOs	1	✔	✔	✔									✔
	2	✔	✔	✔	✔	✔							
	3	✔	✔	✔		✔					✔		
	4	✔	✔	✔	✔	✔					✔		✔
	5	✔	✔	✔		✔				✔	✔		✔

Topics covered in the course with number of lectures on each topic (assume 15 weeks of instruction and 1.5-hour lecture duration)

Topics to be covered:

List of Topics	No. of Weeks	Contact Hours	CLO(s)
Introduction: Introduction to AI, Basic components of AI, Identifying AI systems, Branches of AI.	**1**	**3**	**1**
Intelligent Agents: Agents and Environments, Rationality, PEAS, Environment Types, Agent Types,	**1**	**3**	**1,2,3,5**
Problem Representation: Introduction to Trees and Graphs	**1**	**3**	**1,2,3,5**
Problem Solving by Searching: Informed searching, Uninformed searching, Local searching.	**2**	**6**	**1,2,3,5**
Constraint Satisfaction Problems	**2**	**6**	**2,3,4,5**
Adversarial Search	**2**	**6**	**2,3,4,5**
Learning: Unsupervised learning, Supervised learning, Reinforcement learning	**2**	**6**	**2,3,4,5**
Uncertainty handling	**1**	**3**	**2,3,4,5**
Recent trends in AI and applications of AI algorithms: Trends, Case study of AI systems, Analysis of AI systems	**2**	**6**	**1,2,3,4**
Review	**1**	**3**	**1,2,3,4,5**
Total	**15**	**45**	

Laboratory Projects/Experiments Done in the Course	Lab content provided at the end
Programming Assignments Done in the Course	All the assignments would be programming based (e.g. C++, Java, Python)

Class Time Spent (in percentage)	**Theory (%)**	**Problem Analysis (%)**	**Solution Design (%)**	**Social and Ethical Issues (%)**
	50	25	20	5

Oral and Written Communications	Every student is required to submit at least 1 written report of typically 3 pages. Students will also be called for viva/presentation of the project and any assignment where necessary

Lab/ Practical Component of the course

Weeks	Contents/Topics	Assessment Items (Case Study/ Exercise Assignment/ Quiz etc.)
Week-01	Practical Examples of AI + Basic Python	
Week-02	Types of Agents and Environments to Implement	Task-1
Week-03	Revision of Python concepts and relevant Libraries	Task 2
Week-04	Revision of Trees and Graphs in Python along with other necessary concepts	Task 3
Week-05	Problem Solving by Searching – Uninformed/Blind Search Algorithms	Task 4, Assignment-1
Week-06	Problem Solving by Searching – Informed/Heuristic Based Search	Task 5
Week-07	Adversarial Search	Task 6 Assignment-2
Week-08	Evolutionary Search Algorithms	Task 7
Week-09	Lab Midterm Exam	
Week-10	Introduction to Machine Learning	Task 8, Assignment-3
Week-11	Supervised Learning (KNN, ANNs, SVM)	Task 9
Week-12	Unsupervised learning	Task 10, Assignment-4,
Week-13	Regression Problem Implementation	Term Project
Week-14	Advanced Topics AI	
Week-15	Demos of Project	

Practical/ Programming Work/ Tools:
1) Python

Assessment Instruments with Weights *(homework, quizzes, midterms, final, programming assignments, lab work, etc.)*

Assessment Item	Number	Weight (%)
Assignments	4	10
Lab Tasks	10	20
Lab Mid Term	1	15
Project (Lab)	1	10
Final Exam	1	45

Grading Policy: Relative