**Course:** Artificial Intelligence

**Credits:** 3 Credits / Graduate

**Prereqs:**

**Instructor:** Jiang (Jay), PhD

COURSE OVERVIEW

Welcome to our 15-week course focused on the fundamentals and applications of Artificial Intelligence (AI). This course is designed to provide a solid foundation in AI, covering key concepts, technologies, and their practical implications. We're starting this journey by showcasing AI's edge over human intuition, diving straight into real-world cases that illustrate the advantages of machine intelligence. We'll see how AI not only complements but also enhances our decision-making processes, laying a solid foundation for understanding its transformative impact.

Throughout the course, we will explore important topics like search algorithms, optimization algorithms, knowledge representation and reasoning, and Natural Language Processing, each offering insights into how AI systems are developed and function. We will also delve into advanced areas such as Reinforcement Learning and AI applications in various industries, highlighting the diverse and constantly evolving nature of AI.

By the end, you’ll know the key concepts and tools that make AI work and be ready to apply them to real-world problems. Whether you're just curious about AI or looking to build a foundation for further study or a career, this course has you covered.

COURSE LEARNING OUTCOMES

By the end of this course, students will be able to:

1. Comprehend AI Fundamentals: Develop a comprehensive understanding of Artificial Intelligence, including its history and ethical implications.
2. Master AI Techniques: Gain strong proficiency in essential AI techniques and their applications, with a focus on practical problem-solving skills.
3. Apply AI in the Real World: Learn to effectively apply AI concepts and tools to real-world challenges and innovate solutions.
4. Understand AI's Industry Impact: Understand the role and impact of AI across various industries, recognizing its transformative power in the modern world.

REQUIRED MATERIALS

Programming:

* Projects are to be completed and graded in Python. Basic programming skills in Python are required.
* Some SQL (Structured Query Language) knowledge is helpful but not required.

Texts:

* Artificial Intelligence: A Modern Approach, 3rd or 4th ed., by Stuart Russell and Peter Norvig.
* Additional readings (either web-based or provided by the instructor) will be assigned.

ASSIGNMENTS & GRADING

|  |  |  |
| --- | --- | --- |
| **Components** | **Description** | **Percentage** |
| Class Participation & Discussions | Active engagement and insightful contributions in class discussions. | 20% |
| Homework Assignments | Regular submission of problem sets, coding tasks, and analytical essays. | 30% |
| Projects | Completion of projects demonstrating practical application of AI concepts. | 20% |
| Final Project Proposal | Submission of a clear and structured proposal for the final project. | 5% |
| Final Project | A comprehensive project that applies AI to tackle a significant problem, providing practical solutions and insights. | 15% |
| Project Presentation | Delivery of a clear and engaging presentation of the final project's findings. | 10% |

LATE SUBMISSIONS RULES

Homework past due will have a 10% penalty each day, and no homework will be graded after five days.

GRADING SCALE

|  |  |  |  |
| --- | --- | --- | --- |
| **Quality of**  **Performance** | **Letter Grade** | **Range %** | **GPA/ Quality Pts.** |
| Excellent - work is of exceptional quality | A | 93 - 100 | 4 |
| A- | 90 - 92.9 | 3.7 |
| Good - work is above average | B+ | 87 - 89.9 | 3.3 |
| Satisfactory | B | 83 - 86.9 | 3 |
| Below Average | B- | 80 - 82.9 | 2.7 |
| Poor | C+ | 77 - 79.9 | 2.3 |
| C | 70 - 76.9 | 2 |
| Failure | F | < 70 | 0 |

COURSE SCHEDULE

| **Week** | **Topic** | **Details** |
| --- | --- | --- |
| 1 | Introduction to AI | Overview of AI, history, applications, and ethical considerations. |
| 2 | Search Algorithms I | Uninformed search strategies including depth-first, breadth-first. |
| 3 | Search Algorithms II | Informed search strategies such as A\*, greedy best-first search, |
| 4 | Optimization Algorithms | Gradient Descent, simulated Annealing, and evolutionary computing |
| 5 | Knowledge Representation & Reasoning I | Logic agent, knowledge-based agent |
| 6 | Knowledge Representation & Reasoning II | Semantic networks, ontologies, |
| 7 | Uncertain knowledge and reasoning I | Bayesian networks |
| 8 | Uncertain knowledge and reasoning II | Hidden Markov Models |
| 9 | Introduction to Natural Language Processing (NLP) | ​​Fundamentals of NLP, Text processing |
| 10 | Advanced NLP and Applications | Machine learning in NLP, real-world applications of NLP. |
| 11 | Multiagent Systems | Game theory, cooperative and competitive agents. |
| 12 | Introduction to Reinforcement Learning | Fundamental Algorithms in RL |
| 13 | Advanced Reinforcement Learning Methods | Deep Reinforcement Learning |
| 14 | AI in Industries and Emerging Topics in AI | AI applications in various industries, paired with a discussion on emerging trends in the AI field. |
| 15 | Course Wrap-up and Student Projects | Review of the course, open challenges in AI, student projects. |