

# CSE-3683-01-202510 AI Fundamentals (Spring 2025)

[Jump to Today](#)

## **CSE 3683 AI Fundamentals**

**Time:** Tuesday and Thursday, 9:30am - 10:45am

**Room:** MCCAIN 190

### **Office Hours:**

In-person: Tuesday and Wednesday, 2:00 pm - 3:00 pm in Butler Hall 314

Virtual: Tuesday 1:00pm - 2:00pm on WebEx

<https://msstate.webex.com/meet/jdc1258>

Other times by email appointment.

**Instructor:** Jingdao Chen, [chenjingdao@cse.msstate.edu](mailto:chenjingdao@cse.msstate.edu)

**Teaching Assistant:** Md Elias Hossain, [mh3511@msstate.edu](mailto:mh3511@msstate.edu)

### **TA Office Hours:**

Wednesday: 11:00 am - 1:00 pm

Thursday: 2:00 pm - 4:00 pm

Friday: 10:00 am - 12:00 pm

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## Course Description and Learning Objectives

This course covers the fundamental concepts in theory and practice of Artificial Intelligence (AI). The course will look into how AI systems represent knowledge, develop action sequences, and search for optimal or near-optimal solutions. The course will also explore how computers use machine learning to describe data and make intelligent decisions to achieve goals, while dealing with uncertainty and learning from mistakes. The course will present the history of AI and the applications of AI in various domains, and examine the ethics, security, and legislation of AI.

## Grading

- 5% Participation
- 15% Quizzes
- 10% In-class programming assignments
- 50% Lab assignments
- 20% Group Project
  - 5% Project Proposal
  - 15% Final Presentation

### Grading Scale:

A = 90 – 100 %

B = 80 – 89.9 %

C = 70 – 70.9 %

D = 60 – 69.9 %

F = Below 60 %

## Tentative Course Schedule

*\*Note that this is a tentative schedule subject to changes.*

Index	Date	Lecture	Textbook	Due
1	Jan 16	Course Intro	<a href="#">Jupyter notebook tutorial</a>	

[Links to an external site.](#)

[Google Colab Tutorial](#)

<a href="#">Links to an external site.</a>	
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2	Jan 21	Introduction to Ptolemy Linear Algebra, Probabilities with Python		Lab 0 released
		<b>Symbolic AI</b>		
3	Jan 23	Problem Solving and Search: Depth-first Search, Breadth-first Search	Chapter 3	
4	Jan 28	Problem Solving and Search: Depth-first Search, Breadth-first Search	Chapter 3	In-class exercise 1  (Word Ladder)
5	Jan 30	Problem Solving and Search: Informed and Uninformed Search	Chapter 3	
6	Feb 4	Problem Solving and Search: Iterative Deepening	Chapter 3	
7	Feb 6	Problem Solving and Search: Local search, stochastic search	Chapter 4	Lab 1 released
8	Feb 11	Problem Solving and Search: Beam search, simulated annealing	Chapter 4	
9	Feb 13	Problem Solving and Search: Beam search, simulated annealing	Chapter 4	
10	Feb 18	Problem Solving and Search: Genetic algorithms  Ptolemy Tutorial	Chapter 4	
11	Feb 20	Adversarial Search: Minimax	Chapter 5	<b>Quiz 1 due</b>

12	Feb 25	Adversarial Search: Evaluation functions	Chapter 5	<b>Lab 1 due</b>  Lab 2 released
13	Feb 27	Adversarial Search: Alpha-beta pruning	Chapter 5	
<b>Probabilistic AI</b>				
14	Mar 4	Machine Learning: Supervised and Unsupervised Learning	Chapter 19	
15	Mar 6	Machine Learning: K-Nearest Neighbors, Linear Regression	Chapter 19	<a href="#"><u>Project signup sheet</u></a>

[Links to an external site.](#)

16	Mar 11	Spring break: no class		<b>Project Proposal due</b>
17	Mar 13	Spring break: no class		<b>Quiz 2 due</b>
18	Mar 18	Machine Learning: Logistic Regression	Chapter 20	
19	Mar 20	Machine Learning: Probabilistic Reasoning, Bayes Classifier	Chapter 20	Battlesnake Trials
20	Mar 25	Machine Learning: Markov Chains	Chapter 20	<b>Lab 2 due</b>  Lab 3 released  In-class exercise 2 (Markov Chain Text-Generator)

<b>21</b>	<b>Mar 27</b>	Machine Learning: Markov Chains	Chapter 20	<a href="#">Battlesnake Competition</a>
<a href="#">Links to an external site.</a>				
<b>22</b>	<b>Apr 1</b>	Machine Learning: Gradient Descent, Loss Functions	Chapter 21	
<b>23</b>	<b>Apr 3</b>	Machine Learning: Deep Neural Networks	Chapter 21	
<b>24</b>	<b>Apr 8</b>	Machine Learning: Natural Language Processing	Chapter 23,24	<a href="#">GT NLP</a>

[Links to an external site.](#)

[Speech and Language Processing](#)

[Links to an external site.](#)

[LLM Course](#)

<a href="#">Links to an external site.</a>				
<b>25</b>	<b>Apr 10</b>	Machine Learning: Natural Language Processing	Chapter 23, 24	
<b>26</b>	<b>Apr 15</b>	Machine Learning: Computer Vision	Chapter 25	<a href="#">Szeliski textbook</a>

[Links to an external site.](#)

[PyTorch tutorial](#)

[Links to an external site.](#)

[MNIST Tutorial](#)

<a href="#">Links to an external site.</a>				
27	Apr 17	Machine Learning: Generative Networks	Chapter 25	In-class exercise 3 (Neural Networks in PyTorch)
		<b>AI Alignment</b>		
28	Apr 22	History of AI		
29	Apr 24	AI Ethics, Security, and Regulation		<b>Quiz 3 due</b>
30	Apr 29	Project Presentation #1		Lab 3 due
31	May 1	Project Presentation #2		
32	May 14 (8 - 10am)	(final exam date) Project Presentation #3		Final Report (presentation slides) due

## Textbook

Artificial Intelligence: A Modern Approach, 4th Edition, by Stuart Russell and Peter Norvig

<http://aima.cs.berkeley.edu/>

[Links to an external site.](#)

*This course contains materials that are part of the Bulldog Bundle. The digital materials required for this course have been integrated with Canvas and can be found in the B&N First Day Course Materials link in your Canvas course. Please sign into Canvas to access your course and course materials. Students have the option to opt-out of the program each semester if it is not the most cost-efficient option. Students can visit <https://www.msstate.edu/bulldogbundle> to opt-out of the program.*

## Lab Assignments

Three lab assignments that involve Python programming will be given throughout the semester and is an essential part of understanding concepts in Artificial Intelligence. The assignment should be submitted by the specified due date by the end of the day. Assignments will be graded and returned. Students are responsible for assignments turned in on time; even for days when the student has an excused absence.

Unless otherwise specified, assignments will be done individually and each student must hand in their own assignment. It is acceptable, however, for students to collaborate in figuring out solutions and helping each other understand the underlying concepts. When collaborating, the "whiteboard policy" is in effect: You may discuss assignments on a whiteboard, but, at the end of a discussion the whiteboard must be erased, and you must not transcribe or take with you anything that has been written on the board during your discussion. You must be able to reproduce the results solely on your own after any such discussion. Finally, you must report the names of the students you collaborated with on each assignment.

## Late Submission Policy

### [Links to an external site.](#)

Late assignments will lose 10% per day late (including weekend days), up to a maximum of 50% off. The "days late" number on Canvas should be rounded up, so if Canvas indicates that an assignment is 0.5 days late, 10% will be deducted. The late policy includes extra credit questions, so if a student scores 120 points (100 points + 20 extra credit points) but submitted the assignment one day late,  $120 \times 10\% = 12$  points will be deducted.

## Quizzes

Quizzes represent an opportunity for students to test their understanding and have some indication of their class standing by mid-semester. Quizzes will be open-book and administered through Canvas. The quizzes will consist of multiple-choice questions and will cover material given in the lecture slides, assigned readings, notes, lab assignments, guest lectures, and/or projects. Students may select any 30 minute period within the given one-week period on Canvas to attempt the Quiz.

## Distance Students

Video recordings will be provided for distance students to view the lecture sessions asynchronously. Distance students will need to complete labs and quizzes the same way as non-distance students, i.e., submitting them before the deadline via Canvas. Take-home quizzes will not use remote proctoring services such as Honorlock, but all the students must follow Mississippi State University Honor Code. Distance students are allowed to complete the group project presentation remotely. The Participation grade will be assigned based on active participation in posting relevant comments, questions, and answers about the lectures on Canvas Discussions. The in-class programming sessions will be recorded for the benefit of distance students; asynchronous distance students also have the option of joining the live WebEx sessions to follow along, interact and ask questions. In addition, virtual office hours will be held by the instructor every week to enable distance students to get help on their assignments and projects.

Information about setup and video recording access for distance students is available here: <https://www.bagley.msstate.edu/distance/setup/>

## Continuity of Instruction

In the event that face-to-face classes are suspended due to extenuating circumstances, such as weather, the instructor will continue instruction in a manner that best supports the course content and student engagement. In this event, all instructors will notify students of the change via their university email address (the official vehicle for communication with students). At that time, they will provide details about how instruction and communication will continue, how academic integrity will be ensured, and what students may expect during the time that face-to-face classes are suspended. If a student becomes unable to continue class participation due to extenuating circumstances, (e.g., health and safety, loss of power, etc.) the student should contact their instructor and advisor for guidance. For additional guidance, please refer to [Academic Operating Policy 12.09](#).

## Attendance policy

For on-campus students, this section is a face-to-face instructional class. Students are expected to attend class regularly and to arrive on time. Although class attendance is mandatory, up to **two** absences are allowed during the semester. Sleeping in class, being late, or leaving early without prior notice may result in an unexcused absence. Please refer to [Academic Operating Policy 12.09](#), regarding attendance expectations and accommodations.

**AI policy:** In this class, students are encouraged to use Generative AI Tools such as ChatGPT to support their work. Students must give credit and cite any AI-generated material according to rules of documentation including in-text citations, quotations, and references. Students must also

include the following statement in assignments to indicate use of a Generative AI Tool: "The author acknowledges the use of [Generative AI Tool Name] in the preparation of this assignment for [brainstorming, grammatical correction, citation, etc]."

**University syllabus:** The Mississippi State University Syllabus contains all policies and procedures that are applicable to every course on campus and online. The policies in the University Syllabus describe the official policies of the University and will take precedence over those found elsewhere. It is the student's responsibility to read and be familiar with every policy. The University Syllabus may be accessed at any time on the Provost website under Faculty and Student Resources and at <https://www.provost.msstate.edu/faculty-student-resources/university-syllabus>

### **Acknowledgements**

The materials from this class rely on slides and assignments prepared by Dr. Zhiqian Chen as well as the authors of the AIMA textbook. Their work is gratefully acknowledged.