

[Fall 2026] Syllabus: CSCI 2521
Thinking with Machines: The Art, Science, and Ethics of AI, 3cr.

Course Information

Instructor and TAs

Role	Name	Email
Primary Instructor	TBD	TBD
TA #1	TBD	TBD
TA #2	TBD	TBD
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Meetings

Lecture: Mondays, Wednesdays, 75 minutes, in-person
3 Credits

Prerequisites: No formal prerequisites. Prior coding experience in Python is expected.
Students with limited prior coding experience are encouraged to take CSCI 1521 concurrently.

Course Description

This course introduces modern artificial intelligence to students from all disciplines. The course covers three interconnected areas: understanding how AI works, building real applications with AI assistance, and developing an ethical framework for responsible AI use.

AI Literacy: Trace the evolution of AI from early neural networks to today's large language models. Learn how deep learning works in accessible, non-technical terms. Distinguish between genuine AI capabilities and hype, and identify which models suit specific tasks.

Hands-On Building: Develop your own software project using AI-assisted "vibe coding." Projects might include web or mobile apps, data analysis tools, or research applications. You will work through the full development cycle from design to deployment, with scaffolding provided ensuring the course is accessible to students with varied coding experience. Through direct experience, you will discover what you can accomplish with your current skills and identify what additional skills would make you more effective at AI-assisted development in the future. The emphasis is on experimentation, problem-solving, and understanding your own strengths and growth areas when collaborating with AI tools.

Ethics and Responsibility: Build a personal ethical framework through case studies and reflective writing. Examine algorithmic bias, misinformation risks, privacy concerns, authorship questions, environmental impacts, and AI's broader effects on work and society. Design a

practical AI acceptable use policy for a real-world organization.

Throughout the semester, you will connect hands-on project work with ethical analysis, tracking best practices and learning from peers. The course culminates in student showcases of all projects.

Course Objectives

Upon successful completion of this course, students will be able to:

- *Explain in plain language* how modern AI and deep learning models work and how they have become so powerful.
- *Identify appropriate AI tools* for specific use cases in education, research, and software development.
- *Collaborate with AI* to prototype and refine ideas while identifying the limitations of both AI systems and their own current skill sets.
- *Critically evaluate AI outputs* for accuracy, bias, and reliability.
- *Articulate what additional technical or conceptual skills they need to acquire* to use AI more effectively.
- *Explain AI's broader impacts* on society, work, and the environment.
- *Develop and defend a personal ethical framework* for responsible AI use in academic and professional contexts.

Required Materials

No textbook required. In place of a textbook, a subscription to a world-class AI model such as Chat-GPT Plus, Google AI Pro, or Claude Pro is required during the entire semester. An alternative AI model service may be acceptable; please ask the instructor.

Grading

15% AI Literacy Quizzes

Weekly quizzes on AI Literacy content. The lowest two quiz scores will be dropped.

Expectations and rubric: These weekly quizzes assess understanding of AI concepts covered in lectures and in-class activities. Quizzes are administered in class during the last 10-15 minutes of one lecture session per week using Canvas. They are open-note but individually completed and time. Questions are drawn from a randomized pool with randomized answer order. Each quiz includes a mix of multiple-choice and short-answer questions that emphasize conceptual understanding over recall. Some questions may reference specific in-class examples or demonstrations. AI tools may not be used during quizzes. The lowest two quizzes will be dropped. Each quiz is worth a fixed number of points, with each question weighted equally. Multiple choice questions are scored as correct or incorrect. Short answer questions are scored on a simple scale

(full credit, partial credit, or no-credit) based on the extent to which the response demonstrates understanding of the concept.

50% Software Project Deliverables

Students develop a software application over the course of the semester using AI-assisted development ("vibe coding"). Projects may include web or mobile apps, data analysis tools, research applications, or other software tools. Students must work individually on projects. The project is assessed in four stages:

Stage 1: Specifications and Design (12.5% of semester grade)

Submit a project proposal that includes: a problem statement, a description of the intended users, a list of core features as user stories with acceptance criteria for each (i.e., specific conditions that must be true for the feature to be considered complete), the chosen technology stack with justification, and a development timeline. Evaluation criteria: clarity of problem definition (25%), quality of user stories and acceptance criteria (25%), appropriateness and depth of justification of technology choices (25%), and completeness and justification of the timeline (25%).

Stage 2: Prototype with Tests (12.5% of semester grade)

Submit a working prototype that implements at least two core features, along with a test suite that validates the acceptance criteria for those features. Include a project brief file (e.g., AGENTS.md or equivalent) that provides your AI assistant with context about your project's purpose, architecture, and conventions. Include a brief development log documenting how AI tools were used. Evaluation criteria: functionality of implemented features (25%), test coverage of acceptance criteria (25%), quality of the project brief file and development log (25%), and project structure and ability to explain how the code works at a conceptual level (25%).

Stage 3: Alpha Release with User Feedback (12.5% of semester grade)

Release a functional alpha version that a peer can set up and run by following your documentation. Collect structured feedback from at least three peer users. Submit the alpha, a summary of user feedback, and a plan for incorporating that feedback. Evaluation criteria: completeness and usability of the alpha (25%), quality of setup documentation and deployment readiness (25%), quality of user feedback collection (25%), and thoughtfulness of the feedback response plan (25%).

Stage 4: Final Tech Demo and Report (12.5% of semester grade)

Deliver a live demonstration of the completed project and submit a final written report. The report should include: an overview of the project, a description of the development process and how AI tools were used, a summary of how user feedback from Stage 3 was incorporated (including any revised acceptance criteria and new or updated tests), documentation of changes from alpha to final version, and a reflection on what additional technical or conceptual skills would have made you more effective.

Evaluation criteria: final product status relative to original acceptance criteria, with explanation of any unmet criteria and what was attempted (25%), incorporation of user feedback and documentation of changes from alpha to final version, including revised acceptance criteria and updated tests (40%), quality of reflection on the vibe coding process and personal skill development (15%), and ability to demonstrate and explain the project in a live demo (20%).

30% Ethics Portfolio

The Ethics Portfolio is a collection of written assignments that build toward a personal ethical framework for AI use. All portfolio submissions should be clearly written, cite sources where appropriate, and demonstrate thoughtful engagement with course concepts.

Position Statement (5% of semester grade)

Write a 500-750 word statement articulating your current views on the role of AI in society. This serves as a baseline that you will revisit later in the semester. Evaluation criteria: clarity of stated position (50%), and quality of supporting reasoning (50%).

Case Study Analyses (12% of semester grade in total, 4% each for 3 assignments)

For each case study, analyze a real-world scenario involving AI ethics (topics assigned by instructor). Each analysis should be 750-1000 words and should identify the stakeholders involved, the ethical tensions at play, the relevant course concepts, and your reasoned assessment of the situation. Evaluation criteria: identification and analysis of ethical issues (30%), application of course concepts (40%), and consideration of multiple perspectives (30%).

Reflection on Position Statement (5% of semester grade)

Revisit your original Position Statement and write a 500-750 word reflection on how your views have evolved over the semester. Identify specific experiences, readings, or discussions that influenced your thinking. Evaluation criteria: depth of reflection on how views have changed (50%), meaningful and specific references to course experiences (50%).

AI Ethics Framework / AI Acceptable Use Policy (8% of semester grade)
 Design a practical AI acceptable use policy for a real-world organization of your choosing (a university department, a company, a nonprofit, etc.). The policy (1500-2000 words) should address: scope and applicability, permitted and prohibited uses, citation and transparency requirements, data privacy considerations, and accountability mechanisms. Evaluation criteria: comprehensiveness of the policy (35%), practicality and enforceability (30%), and grounding in ethical principles from the course (35%).

5% Participation

Participation is assessed through two components: completing a brief exit pass at the end of each class session (requires attendance), and contributions to online discussion boards or the course platform. Students who attend regularly, submit exit passes, and engage constructively in class and online will earn full participation credit.

Schedule

Approximate weekly schedule. Subject to change.

Week	Topics	Assignments Due
1	Course Intro. History of AI, key milestones, supervised/unsupervised learning, Intro to NNs.	
2	Vibe Coding in Practice: Hands-on intro to using AI for code generation, testing, and debugging; using templates.	Ethics Portfolio: Position Statement Weekly Quiz
3	Project Design Workshop: In-class ideation, defining features, user stories, choosing tech stack.	Software Project: Specs/Design Weekly Quiz
4	Project Prototyping: Strategies for iterative development and testing.	Ethics Portfolio: Case Study #1 Weekly Quiz
5	How AI Thinks: NNs as matrix math, backpropagation simply explained. High-level transformer architecture.	Weekly Quiz
6	Intro to AI Ethics: Algorithmic bias, privacy, and the importance of explainability/transparency.	Weekly Quiz

Week	Topics	Assignments Due
7	Peer Review & Iteration: In-class session to share prototypes, troubleshoot, and give/receive feedback.	Weekly Quiz
8	AI Ethics in Academia: Effects of AI in education, authorship/IP, and ethical use in scientific research/publications.	Software Project: Prototype Weekly Quiz
9	Environmental Impact & Ethics in Industry: Environmental costs, challenges, and strategies for corporate AI use.	Ethics Portfolio: Case Study #2 Weekly Quiz
10	AI Guardrails and Open Models: Discussing model alignment, guardrails, and "uncensored" model implications.	Weekly Quiz
11	Project Alpha Version Release: Moving from prototype to shareable alpha version. Project upvoting begins.	Software Project: Alpha Release Weekly Quiz
12	Choosing the Right Tool: Which models are best for which tasks? When is deep learning overkill?	Ethics Portfolio: Case Study #3 Weekly Quiz
13	AI Applications Showcase: Guest lecture week focusing on deep learning in different fields (e.g., biology).	Ethics Portfolio: Reflection on Position Statement Weekly Quiz
14	The Future of AI and Society: Discussion on the path to AGI, the future of work, and the landscape of AI regulation.	Weekly Quiz
15	Project Refinement Workshop; Top Project Demos (Part 1): Incorporating feedback, prep for final showcase.	Software Project: Final Report

Grade Scale

Grade	GPA Points	Definitions for undergraduate credit
A	4.000	Represents achievement that significantly exceeds expectations in the course.
A-	3.667	
B+	3.333	
B	3.000	Represents achievement that is above the minimum expectations in the course.
B-	2.667	

C+	2.333	
C	2.000	Represents achievement that meets the minimum expectations in the course.
C-	1.667	
D+	1.333	
D	1.000	Represents achievement that partially meets the minimum expectations in the course. Credit is earned but it may not fulfill major or program requirements.
F	0.000	Represents failure in the course and no credit is earned.

See Administrative Policy: [Grading and Transcripts](#) for more information.

Extra Credit: there are no extra credit opportunities in this course.

Late Work & Makeup Exams

Each student has 5 total days of grace period throughout the semester, with no more than 3 days to be used on any one assignment. These can be used only for the software project deliverables and the ethics portfolio assignments. Delay time is rounded to days and is always rounded up. Any additional late time will be penalized at 1% per hour, rounded up to the nearest hour. Incompletes will, in general, not be given. Exceptions will be considered only when a provably serious family or personal emergency arises, formal written proof is presented, and the student has already completed all but a small portion of the work.

Attendance Policy

This is an in-person, interactive course. Lecture attendance is required.

AI Usage Policy

Artificial intelligence (AI) language models, such as ChatGPT, may be used for any assignment with appropriate citation, except where expressly prohibited. When you cite AI, you must provide a direct, permanent link to the relevant chat transcript, using the AI Archives Google Chrome plugin (<https://aiarchives.org>) or an equivalent resource. You are responsible for fact checking statements composed by AI language models. When you use an AI model for assistance with an assignment, you must use an AI assistant account that saves your chat history for future reference. Be prepared to log in to your AI assistant account and show your "live" chat history to the instructor or TAs.

Final Exam

There is no final exam; there is a final project instead.

Student Workload Statement

Per the University of Minnesota's Administrative Policy: Expected Time per Course Credit (<https://policy.umn.edu/education/timepercredit>), students should expect approximately 3 hours of academic work per week for each credit. As a 3-credit course, students should expect to

spend approximately 9 hours per week on this course, including 2.5 hours of in-class time and roughly 6.5 hours of work outside of class. Time outside of class will be spent on software project development, ethics portfolio writing, quiz preparation, and reviewing course materials.

University Policies

This course adheres to all university-wide policies regarding Student Conduct; Use of Personal Electronic Devices in the Classroom; Scholastic Dishonesty; Makeup Work for Legitimate Absences; Appropriate Student Use of Class Notes and Course Materials; Grading and Transcripts; Sexual Harassment; Equity, Diversity, Equal Opportunity, and Affirmative Action; Mental Health and Stress Management; and Academic Freedom and Responsibility. Please read the full policies provide below, also available here:

<https://policy.umn.edu/education/syllabusrequirements-appa>

Student Conduct Code

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. To support this environment, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University, you are expected to adhere to the Board of Regents Policy: Student Conduct Code. Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach and/or a student's ability to learn." The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities.

Access the Student Conduct Code here: [policy_student_conduct_code.pdf](#)

Use of Personal Electronic Devices in the Classroom

Using personal electronic devices in the classroom setting can hinder instruction and learning, not only for the student using the device but also for other students in the class. To this end, the University establishes the right of each instructor to determine if and how personal electronic devices are allowed to be used in the classroom. For complete information, please review the Administrative Policy: [Teaching and Learning: Student Responsibilities](#).

Scholastic Dishonesty

As students in a university community, you are expected to do your own academic work, and to cite sources of knowledge that you draw on in completing your assignments and other academic work. Failing to do so is scholastic dishonesty, which includes: plagiarism; cheating on assignments or examinations, including the unauthorized use of online learning support and

testing platforms; engaging in unauthorized collaboration on academic work, including the posting of student-generated coursework on online learning support and testing platforms not approved for the specific course in question; taking, acquiring, or using course materials without faculty permission, including the posting of faculty-provided course materials on online learning support and testing platforms; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, misrepresenting, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. When it is determined that a student has cheated, the student may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see: [Teaching and Learning: Student Responsibilities](#).

Additional resources pertaining to academic integrity can be found through the [Office for Community Standards](#) and the [Center for Educational Innovation](#).

Beware of websites that advertise themselves as being “tutoring websites.” It is not permissible to upload any instructor materials to these sites without their permission or copy material for your own homework assignments from these various sites. When you have additional questions and concerns, please speak with or email your instructor to clarify practices expected for the course. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class, for example, when and whether collaboration on assignments is permitted, when citing sources is required and what citation method to use, or when and which electronic aids are permitted or prohibited during an exam.

Makeup Work for Legitimate Absences

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see Administrative Policy: [Makeup Work for Legitimate Absences](#).

Appropriate Student Use of Class Notes and Course Materials

Taking notes is a means of recording information and more importantly of personally recording, integrating, and connecting information as part of your educational experience. However, broadly disseminating class notes beyond the current classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests

in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see: Administrative Policy: [Teaching and Learning: Student Responsibilities](#).

Sexual Harassment, Sexual Assault, Stalking and Relationship Violence

The University prohibits sexual misconduct, and encourages anyone experiencing sexual misconduct to access resources for personal support and reporting. If you want to speak confidentially with someone about an experience of sexual misconduct, please contact a confidential [resource on your campus](#). If you want to report sexual misconduct, or have questions about the University's policies and procedures related to sexual misconduct, please contact your campus [Title IX office or relevant policy contacts](#).

Instructors are required to share information they learn about possible sexual misconduct with the campus Title IX office that addresses these concerns. This allows a Title IX staff member to reach out to those who have experienced sexual misconduct to provide information about personal support resources and options for investigation. You may talk to instructors about concerns related to sexual misconduct, and they will provide support and keep the information you share private to the extent possible given their University role.

For more information, please see Administrative Policy: [Sexual Harassment, Sexual Assault, Stalking and Relationship Violence](#).

Equity, Diversity, Equal Opportunity, and Affirmative Action

The University provides equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, familial status, disability, public assistance status, membership or activity in a local commission created for the purpose of dealing with discrimination, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: Equity, Diversity, Equal Opportunity and Affirmative Action here: [policy_equity_diversity_equal_opportunity_and_affirmative_action.pdf](#)

Disability Accommodations

My goal is to create a learning environment that is accessible and inclusive for all students. If you anticipate any barriers related to the design of the course (such as the format, materials, or structure), please contact the instructor outside of class so we can explore potential options. If you have a disability and want to explore formal accommodations and/or further resources, please contact our campus Disability Resource Center (DRC): disability.umn.edu or drc@umn.edu

If you have already consulted with our DRC, please share your letter with the instructor as soon as you can to discuss how your accommodations will be implemented in this course .

Mental Health and Stress Management

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the [Student Mental Health Website](#). As an instructor/University community member, we care about the wellbeing of students. If health, safety, or mental health concerns are conveyed , we may consult with campus support offices to provide support and resources to a student.

Academic Freedom and Responsibility

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.*

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor or your advisor.

This publication/material is available in alternative formats upon request. Please contact the Computer Science & Engineering Department at 612-625-4002 / csdesk@umn.edu / 207 Church St SE Minneapolis, MN 55455.