

EM 534.001/601 Artificial Intelligence for Engineering Managers

3:00-4:15 MW FW 4134 EM 534 Section 534.001
Online Section in Moodle and Panopto as EM 534.601
Fall 2026

Welcome to Artificial Intelligence for Engineers, a transformative course designed for forward-thinking professionals eager to harness AI's potential in engineering management. As AI continues to revolutionize industries, this course provides you with the essential knowledge and tools to lead AI-driven innovation, improve your management skills with AI, and become a trailblazer in this era of unprecedented technological growth.

This course takes a holistic approach to AI, equipping engineers and managers with a deep understanding of its history, applications, and future trends. From the birth of AI in the 1950s to its exponential growth in the 21st century, we'll explore the evolution of machine learning, generative AI, AI agents, and other groundbreaking technologies that are shaping industries ranging from manufacturing to healthcare. The future of AI will be discussed extensively.

But this isn't just about understanding AI—it's about leading it. Artificial Intelligence for Engineers focuses on empowering students to manage AI projects effectively and to bridge the gap between engineering and leadership. You'll learn to:

- **Evaluate and Select AI Tools:** Gain hands-on experience with cutting-edge tools and compute platforms to ensure you choose the best solutions for your needs and your organization's unique needs.
- **Plan and Budget AI Projects:** Develop detailed project plans, from cost estimation to deployment, ensuring a streamlined approach to implementing AI technologies.
- **Address Real-World Challenges:** Understand data sourcing, cleaning, training, and testing techniques to tackle some of the most pressing challenges in AI project management.
- **Assess AI's Organizational Impact:** Dive deep into the ethical, economic, and workforce implications of AI to make informed decisions that balance innovation with responsibility.

This course is tailored for engineers with a managerial mindset. Whether you're leading teams in manufacturing, software development, or beyond, you'll acquire skills that set you apart as a forward-thinking leader who understands how to integrate AI into business strategies.

Guided by industry experts and seasoned academics, this course offers practical insights drawn from real-world case studies, interactive discussions, and hands-on assignments. By the end of the program, you'll not only understand the technical and managerial aspects of AI but also be equipped to drive transformative projects that impact your organization and industry.

In today's rapidly changing technological landscape, understanding AI is no longer optional—it's essential. Join us in Artificial Intelligence for Engineers and take the next step in your career by becoming the leader who shapes the future.

SYLLABUS

EM 534-001 and EM 534-601 AI for Engineering Managers Mon-Wed 3-4:15 FW 4134 and Online

With the proliferation of artificial intelligence (AI) in almost every enterprise, it is quickly becoming a necessity that engineering managers are competent to manage AI, LLM, and machine learning projects that include identifying relevant datasets, choosing appropriate algorithms, training, testing, tuning, and deployment. In addition, the engineering manager must be able to judge when and where AI adds value and should be used. To manage engineers who are carrying out AI projects, engineering managers must have a reasonable degree of technical understanding of AI. This is a broad survey course rather than a deep technical dive. Topics include the history of AI, machine learning, and generative AI, and touch on computer vision, natural language processing, humanoid robots, and agent-based models.

The course begins with a history of Artificial Intelligence, explaining why things evolved as they did. A survey of AI methods and algorithms will then be covered, including machine learning, deep learning, generative AI, transformers, computer vision, natural language processing, large language models (LLMs), and AI agents. The objective is to train the engineering manager to understand the scope and limitations of each technique. An overview of data science, including the identification of relevant data sets will be included.

Applications of AI will be addressed, including but not limited to AI in FinTech, AI in Healthcare, and AI to understand buyer behavior. By the end of the course, students will be able to estimate compute resources including token costs required for a project, create a project plan, and estimate the costs and time required, including the types of people and amount of labor needed, and students will understand AI and relevant terminology sufficient to communicate and lead a team of people, and to assess the impact of a given application on the firm, the workplace, or the economy. The course will also address humanoid robots, AI startups, data and compute requirements for AI, and how to manage an AI project. AI project management and AI product management are a significant focus of the course.

This is not a course that teaches students to be machine learning or AI engineers. Students may or may not have that as their prior background. This course focuses on how to deploy and manage AI projects and how to decide whether to adopt AI for a particular problem or product. Students will learn to create project plans for AI products and projects. In addition, students will learn to assess the impact of AI's disruptive changes on the workplace and the economy.

This course is offered both as a campus section (in hybrid format) course and an online course. The course requirements are the same for both, but the venue is different. Campus students attend classroom lectures, meet with teams at the end of class, and have a final presentation in class. Discussions occur both in class and in the forum. Online students view lectures in Panopto, discussions in the forums, and submit assignments online, with final presentations done by recorded video.

•Prerequisites

Admission to the MEM Program or an engineering management graduate certificate. Other engineering graduate students, including Engineering Online students, may take the course with permission.

•Course Topics

- History of AI
- Limitation of AI
- Terminology for AI
- Introduction to machine learning and deep learning
- Overview of computer vision
- Overview of natural language processing
- Introduction to Generative AI and Transformer Architectures
- Generative Adversarial Networks
- Exposure to agent-based models
- Survey of AI methods: Bayesian Reasoning, Genetic Algorithms, Expert Systems
- Relationship with signal processing, pattern recognition and data analytics
- AI Enabled Systems. Integration of AI into engineered systems.
- Open-Source Tools and Licensing
- Sourcing and Managing Data, Managing Rights
- Scrubbing and cleansing of data, and cost estimation
- Re-use of AI Models
- LLMs, Prompt Engineering and Responsible Use, ChatGPT
- Adopting LLMs in an Organization
- Multi-Modal Generative AI
- Agents and Multi Agent AI
- Humanoid Robots and the Potential Economic Impact
- Computer Power Required for Training LLMs and AI Models
- Disruptive Nature of AI and Impact on the Work Force
- Impact of AI on the Economy, the Workplace and Society
- Impact of AI on Organizations
- Great Debates about AI and Society, Ethics, Perils
- Product Management for AI Projects
- Choosing Tools, data sets, people
- Project Management Planning for AI projects and products
- Building an AI Native Product
- Applications: Market Analytics, FinTech, Drug Discovery, Sports Analytics, Law
- Application to Scientific research
- Managing Engineering Teams for AI Projects
- Using AI as a Management Tool
- Ethical Concepts Related to AI
- Future of AI

• Course Expectations

Students are expected to attend class and participate in forum discussions (online students must view presentations and engage in additional forum exercises instead of attending class). Students will work in groups for 3 major assignments and complete an individual paper.

•Grading Formula

Grades are a necessary part of earning a degree. That said, this is an elective course, and we hope you are here to learn and have fun. Your grade is based on the following requirements and weightings. The grading policy is posted below. There is no final exam.

Attendance, Participation, Course Engagement, Management Evaluation Exercise, Peer Review	20%	Based on completion of Moodle activities, number of posts, your team's peer review, and the quality/originality of your initial posts, participation and performance in peer reviews.
Group Exercises	45%	3 Group Project Assignments (1) No-Code / Low Code Machine Learning Exercise (2) AI-Augmented Engineering Management - Tools for the Job in a typical week (3) Project Management Plan for an AI-Enabled System: Drones to Detect Sharks
10-Minute Pop Quizzes (best 6 of 7)	15%	Moodle-based 10-minute quiz, open book, online, not announced in advance
Final Group Project	20%	Complete project plan for Enterprise implementation of Generative AI with Agents

•Course Sections

This course has two sections: EM 534 (which meets on campus) and EGR 590 (which meets online asynchronously). The two courses are identical in content but vary in format. The campus section must attend class (it is not an online or hybrid course)..

•Quizzes

There are 7 online open-book pop quizzes in the course (***not announced in advance***, taken in class or within a specified time range for online students). These will be taken in class for campus students. Each is 10 minutes long, in a multiple-choice format covering the readings, forum postings, presentations, and discussions. Generative AI is prohibited for these quizzes. The purpose is to test your course engagement and your ability to communicate about AI.

•Textbooks

The course is a synthesis based on Journal Articles, Online Papers, PDF Handouts, and Material Presented in Class. No textbook is required, but references will be suggested.

•Course Philosophy

This course prepares engineering managers to lead AI initiatives rather than develop AI algorithms. The emphasis is on understanding AI capabilities, applications, limitations, and project management—not heavy programming or advanced AI implementation. Students will learn how to work effectively with AI engineers, manage AI-enabled projects, evaluate AI solutions, and use modern AI tools to become more effective engineering managers.

•Assignment Submission

All assignments must be submitted via Moodle. All students must submit each assignment (even if it is a group assignment). The front page of group assignments must list the names of group members. Students must submit a participation report at the end of the course as well as a peer review of their team members. Assignments may not be submitted by email.

•Computer Requirements

NCSU and Engineering Online have recommended minimum specifications for computers. This course will be administered from Moodle and Panopto. Students should log in to Moodle for course modules, announcements, links to videos, and other course activities. See course policies below.

•Instructor Contact and Office Hours

Dr. Edwin R. Addison (Ed), Lecturer

Engineering Online and MEM Program
Bio provided in Moodle and on LinkedIn

Email: eraddiso@ncsu.edu (preferred contact)

Mobile Number:

910.398.1200 Use texting only for urgent matters

Office Hours:

2-3 pm Monday and Wednesday in FW 4326
5-6 pm Thursday by Zoom (upon request)

•Course Teaching Assistant

The course TA will be available for student assistance and will grade assignments. The course instructor will review the grading before it is considered final. The TA for this semester is Chun-Wei Chang, cchang25@ncsu.edu

Course Modules

MOD	TOPICS	Start DATE	DUE THIS WEEK
1	Course Overview, Requirements. What is AI? History, scope, and methods of AI. The 50-year evolution of AI. Introduction to Machine Learning.	8-17	Post Bio, Choose Teams, Prep for Assignment #1
2	Introduction to Neural Networks and Machine Learning. Survey of Machine Learning methods, applications, and nature of projects. Exposure to Deep Learning, CNNs, RNNs, GANs. Applications in Computer Vision.	8-24	Discussion #1
3	ML Tools (What is PyTorch, TensorFlow?) and Open-Source Tools, Models, and Datasets. Low-code and No-Code ML Tools. Use and Prompting of LLMs. Transformer Architecture. Embeddings. Tensors. Labor Day (9/7) is a holiday – no class.	8-31	Assignment #1 Due 9/8
4	How LLMs are Trained. Multi-Modal Generative AI. Application of AI to assist Engineering Managers in doing their Agents. Further introduction to Tools. Practice Using Them.	9-9	Discussion #2 (Assignment #2 begins)
5	Training LLMs. RAG. Application of AI to assist Engineering Managers in doing their Agents. Tools for building agents. Application for Agents. Practice using tools to aid the engineering manager.	9-14	Discussion #3
6	AI Enabled Systems Engineering. Introduction to Assignment #2. Project Management: AI Model Development: Infrastructure, Tools, Data Sources, Model Development, Tuning. Data Science	9-28	Assignment #2 Due 10/4
7	AI Product Management. Impact on Product Management, Commercialization. Staffing a Project. Agile. Impact on Costs. KPIs. Assessing ROI. Deliverables. AI Startup Companies	10-5	Discussion #4 (Assignment #3 begins)
8	Assessing Data and Compute Requirements, CPU Requirements, and Memory. Data Centers. Nvidia Chips and Products. Rubin. The AI factory. AI in the enterprise. Token costs and trends. No class during Fall Break (10-19)	10-12	Discussion #5
9	Generative AI adoption, implementation, use, governance, guardrails. Introduction to AI Ethics	10-26	Assignment #3 due
10	Multi-agent tools. Tools for Multiagent Development. Orchestration. Exposure to Governance, Guardrails and Ethics. Introduction to Palentir	11-2	Discussion #6 (Assignment #4 Begins)
11	Enterprise AI. Current issues inb enterprise AI adoption.	11-9	Discussion #7
12	Economics of AI. Disruption. The token economy. Great Debates in AI. Is AGI possible? AI constitution.	11-16	Discussion #8 Participation Report Due by 11/22
13	Work Period for Final Project. Students present their project management plans. NOTE: Class on 11/25 will be held by Zoom.	11-23	Project Work Period
14	Submit a report (as a team), and evaluate other presentations from a managerial viewpoint.	11-30	Final Assignment (#4), Presentation, Peer Review, and Evaluation Exercise

● General Course Policies

Assignment Submission. All assignments must be submitted in Moodle. Assignments submitted via email are not accepted.

Late Assignments – Assignments must be submitted by the due date. Late assignments are penalized by 10% and accepted up to one week late; no assignment may be submitted more than one week late for any reason. Assignments due in the last week of class may not be submitted late; failure to submit them results in a grade of 0. ***Moodle assignment due dates will not be changed for any reason.***

Attendance. Campus students are required to attend class. Students may miss up to 20% of the class periods without penalty. No reason needs to be given for an absence. Students who attend less than 80% of the class sessions will have a grade reduction (one-third of a letter grade per 5-point range in percentage attendance – for example, attending 73% of the sessions would lower an A- to a B). The online section does not meet synchronously, and attendance is evaluated based on online presence and posting. All presentations are posted in Panopto, all assignments are posted in Moodle, and participation is assessed based on course activities and contributions to the online forum.

Grading. Responses to assignments and posts, and grading of assignments is accomplished by a variety of means that include any or all of the following: replies by the TA, instructor or fellow students; replies by an AI agent or grading tool with explicit assignment grading baked in, automatic grading tools, first pass grading of assignments by the TA, a final review by the instructor, and possibly other methods. Grades are considered final and non-negotiable for fairness reasons. However, there is an appeal policy for specific issues. See below.

Grade Appeals. Individual assignment grades may be appealed only for concrete reasons. The policy is separately posted and will be strictly adhered to.

Posting to Discussion Forums – Discussion forums are an important part of this course and provide an extensive forum for discussing course content in ***both the online and classroom sections***. The initial questions will be posted at the beginning of the week, but additional questions may be added at any time. These are intended to be conversations, not solo essays. You are not graded as if it were a homework assignment, but rather, you are graded for your active contribution to an intelligent conversation. You need not be comprehensive in your posts. Instead, keep the conversation flowing and post only one idea at a time. You should log in periodically between Wednesday and the end of the week. You are required to read everything that any student posts. You should make an initial post by Thursday and at least two (and not more than three) follow-up posts by Sunday.

Pop Quizzes. Short quizzes will be given unannounced. These are typically 5-6 multiple-choice questions done online. Bring your laptop to class every session! They last 10 minutes tops and are open book, but generative AI is prohibited from answering quiz questions. The purpose is to ensure your regular attendance and that you keep up with course content. All material, including lectures, slides, readings, and anything students post to the forum discussions, is valid material for quizzes. The questions are not difficult but test your engagement and communication skills.

Incomplete Grades. You may be given an Incomplete grade for the course if you were not able to finish due to an unforeseen circumstance. This requires permission from the instructor by Module 12. Incomplete grades must be made up within 30 days.

Course Calendar. The course calendar is posted in both this syllabus and Moodle. Students are expected to remain on the currently scheduled module. Moodle modules are open on the Friday before the week they are scheduled, and all work for the current module is due by Tuesday at 4:30 pm following the week of the module. To avoid plagiarism or other AI tools, ChatGPT may be used and is encouraged

for research, but you must cite it and write your own final copy. The use of Grammarly is encouraged and permitted without an attribution requirement. Respect others' privacy.

Do not submit other students' work as your own. Students must abide by the instructions on assignments and quizzes as to what is permissible for that assignment or quiz. "Violations of academic integrity will be handled by the Student Discipline Procedures ([NCSU REG 11.35.02](#))."

This course has zero tolerance for students who

- ...receive unauthorized aid from others/internet on graded events.
- ...give unauthorized aid to others/internet regarding graded events.
- ...fail to provide proper attribution for help received (plagiarism).
- ...post course materials online without the instructor's permission.

Students who engage in these behaviors may be referred for academic discipline or receive a failing grade in the course or both.

Additional NC State Rules and Regulations. This course engages diverse scholarly perspectives to develop critical thinking, analysis, and debate, and inclusion of a reading or media does not imply endorsement. Students are responsible for reviewing the NC State University Policies, Rules, and Regulations (PRRs) that pertain to their course rights and responsibilities, including those referenced both below and above in this syllabus:

[POL 04.25.05 Equal Opportunity and Non-Discrimination Policy Statement](#)

[REG 02.50.03 Grades and Grade Point Average](#)

[REG 02.20.01 Academic Accommodations for Students with Disabilities](#)

[REG 02.20.15 Credit-Only Courses](#)

[REG 02.20.04 Audits](#)

[POL 11.35.01 Student Conduct](#)

[REG 08.00.11 Online Course Material Host Requirements](#)

[REG 11.35.05 Code of Student Conduct](#)

[REG 11.35.02 Student Discipline Procedures](#)

[REG 02.20.03 Attendance Regulations](#)