

EM 534.651 Artificial Intelligence for Engineering Managers

Campus Class: 3:00-4:15 Monday and Wednesday in FW 4134. Online class delivered by Panopto and Moodle.

Spring 2026

Welcome to Artificial Intelligence for Engineers, a transformative course designed for forward-thinking professionals eager to harness the potential of AI in engineering management. As AI continues to revolutionize industries, this course provides you with the essential knowledge and tools to lead AI-driven innovation, making you 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, 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, bridging 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, ensuring you choose the best solutions for 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, addressing 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, enabling you 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 534-601 and EGR 534-651 AI for Engineering Managers Mon-Wed 3-4:15 FW 4311 and Online

With the proliferation of artificial intelligence (AI) to almost every enterprise, it is quickly becoming a necessity that engineering managers are competent to manage AI, LLM and machine learning projects that include the identification of relevant data sets, 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 touches 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 and transformers, computer vision, natural language processing and large language models (LLMs). 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 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.

This is not a course that teaches the student to be a machine learning or AI engineer. 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 make decisions about 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 the disruptive changes of AI 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 and 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, discussion 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
- 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
- Economics of AI
- 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 Objectives

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

- Identify areas where AI will provide a technical or competitive advantage
- Explain the foundational concepts of artificial intelligence, machine learning, and generative AI in clear managerial terms.
- Differentiate between traditional software systems and AI-driven systems.
- Use no-code and low-code AI platforms to prototype solutions and explore machine learning and generative models.
- Apply large language models (LLMs) and AI agents to support decision-making, communication, and project tasks.
- Pose the question or problem that an AI system is intended to solve
- Determine data requirements for an AI or machine learning system including type, quality, quantity
- Source data sets internally, on the web or externally through vendors
- Explain the major AI paradigms including neural networks, deep learning, transformers, generative AI, large language models, natural language processing and computer vision
- Understand which paradigm is applicable and why
- Understand responsible uses of LLMs and how to train and implement them
- Determine whether a novel algorithm is needed or if an open-source algorithm may be used, and assist in choosing which one
- Manage the training of an AI system, followed by performance measurement, tuning and improvement
- Plan and oversee AI initiatives, including data sourcing, model training, and deployment
- Distinguish between managing AI projects and managing traditional engineering projects, noting unique risks and requirements.
- Integrate AI into managerial workflows such as scheduling, reporting, forecasting, and team collaboration.
- Evaluate when and how AI can augment human judgment in management decisions.
- Assess ethical, operational, and organizational risks in AI adoption.
- Recognize issues of bias, fairness, transparency, and accountability in AI-driven decisions.
- Translate technical AI concepts into business and strategic language for executives.
- Confidently collaborate with data scientists, engineers, and cross-functional teams on AI initiatives.
- Estimate compute resources and cost necessary for a particular AI project
- Create a project plan for an AI project including staffing, labor loading, Gantt chart, development, training, performance evaluation, tuning and deployment
- Be inspired to create and implement tomorrow's new systems and products using AI
- Be able to communicate about AI and be respected as a manager of engineers working with 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 and Peer Review	15%	Based on completion of Moodle activities, number of posts, your team's peer review, and the quality/originality (ChatGPT output is not original) of your initial posts
Group Exercises	50%	3 Group Assignments (1) No-Code / Low Code Machine Learning 15% (2) Generative AI Platform Implementation Plan 15% (3) AI Project Management Plan or Product Development Plan 20%
Quiz on AI Concepts	15%	Moodle based 30 minute quiz, open book, online
Individual Paper	20%	How to use AI in an Engineering Management Job

•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 and participation is evaluated based on classroom activities.

•Course Assignments

There are 3 group assignments in this course. These include:

- Low Code/No Code Machine Learning Model Creation using established tools and data sets with reflective memorandum on how to manage a machine learning project
- Detailed Implementation Plan for a Multimodal Generative AI System with Ability to Create Agents for an Enterprise
- There is a project management plan for an AI product, internal software implementation or client engagement with a final presentation

There is an individual paper where students describe the best practices and currently useful techniques for using AI to assist an engineering manager in doing their job.

•Textbooks

Course is based on Journal Articles, Online Papers, and Material Presented in Class. No textbook is required.

•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.

•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)

Use texting only for emergencies

Mobile Number: 910.398.1200

Office Hours:

2-3 pm Monday and Wednesday in FW 4326

5-6 pm Thursday by Zoom (upon request)

Course Modules

MOD	TOPICS	COURSE ACTIVITIES	Start DATE	DUE THIS WEEK
1	Course Overview, Requirements. What is AI? Applications and use cases for AI**	Lecture #1 AI Applications (TA)	1-12	Post Bio
	MLK Holiday	No Class	1-19	
2	Overview and History of AI: Introduction, History, Limits, Terminology. Machine Learning and Deep Learning Projects.	Lecture #2 Class Discussion	1-21	Discussion #1
3	Capabilities and Breadth of AI: Computer Vision, Bayesian, Agent Based Models, Generative AI, Open-Source Tools. Kaggle.	Lecture #3 Class Discussion Team Meeting (Pick Team)	1-26	Discussion #2
4	LLMs Use Cases, Transformers, NLP, Available LLMs, ChatGPT, Hugging Face. Capabilities and Limitations. Implementation.	Lecture #4 Team Meeting (Assg. #1)	2-2	N/A
5	Generative AI continued. Multi-modal Gen-AI. Hugging Face. GenAI Models. No code AI for Python, Analytics. Managing implementation	Lecture #5 Team Meeting (Assg. #1)	2-9	Assignment #1
6	LLMs Adopting – Project Management Approach to Implementing LLMs. Responsible Use. AI Agents.	Lecture #6 Class Discussion Team Meeting (Assg. #2)	2-26	Discussion #3
7	Disruption and AI: Impact on Economy, Jobs and Labor Force. Adoption Rates. Market Size. Economic and human factors.	Lecture #7 Class Discussion	2-23	Discussion #4
8	Application of AI to assist Engineering Managers in Doing their Job	Lecture #8 Team Meeting (Assg. #2)	3-2	N/A
9	Project Management: AI Model Development: Infrastructure, Tools, Data Sources, Model Development, Tuning. Data Science.	Lecture #9 Assignment #2 Due	3-9	Assignment #2
	SPRING BREAK WEEK	NO CLASS	3-16	
10	AI Product Management. Impact on Product Management, Commercialization. Staffing a Project. Agile. Impact on Costs. KPIs. Assessing ROI. Deliverables.	Lecture #10 Class Discussion	3-23	Discussion #5
11	Assessing Data and Compute Requirements, CPU Requirements, and Memory. Data Centers.	Lecture #11	3-30	Individual Paper
12	Advanced Topics, Humanoid Robots, Ai “Scientists” and “Employees”. Multi Agent Systems. Future Directions in AI. AGI.	Lecture #12 Team Meeting (Assg. #3)	4-6	Online Quiz
13	AI Startup Companies and Venture Capital. Ethical Considerations. Vision Setting. Project Work Period. Evaluating Ai Talent.	Lecture #13 Team Meeting (Assg. #3)	4-13	Participation Report Due
14	Work Period for Final Paper / Project	Peer Review Due	4-20	
	PRESENTATION OF FINAL PROJECT	Course Ends 4-29	4-27	Assignment #3

• 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.

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.

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.

Accommodations. “Reasonable accommodations will be made for students with verifiable disabilities. To take advantage of available accommodations, students must register with the Disability Resource Office at Holmes Hall, Suite 304, 2751 Cates Avenue, Campus Box 7509, 919-515-7653. For more information on NC State’s policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (NCSU [REG 02.20.01](#)).”

Digital Course Components. Students must access this course via Moodle. Students will need a laptop, desktop or other access to a computer and the internet to do so. The course will use the software Turnitin to detect plagiarism and inappropriate use of ChatGPT or other AI tools in written assignments. 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.

Privacy. Students may be required to disclose personally identifiable information to other students in the course via digital tools, such as email or web postings, when relevant to the course. Examples include online discussions of class topics and posting of student coursework. All students are expected to respect each other’s privacy by not sharing or using such information outside the course.

Academic Integrity. Students are required to comply with the academic integrity standards in the Student Code of Conduct ([NCSU POL11.35.01](#)). Students may not submit other students’ work as their 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. 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:

Equal Opportunity and Non-Discrimination Policy
Statement <https://policies.ncsu.edu/policy/pol-04-25-05>
with additional references at <https://oied.ncsu.edu/divweb/policies/>

Code of Student Conduct
<https://policies.ncsu.edu/policy/pol-11-35-01>.