APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN ENGINEERING, CERTIFICATE

This certificate is designed to introduce undergraduate engineering students to core principles of the effective use of Artificial Intelligence (AI) tools, which is a skillset in high demand across all engineering fields. Students may choose from a wide variety of courses to complete the certificate, which should include a course in methods and a course in ethics. The culminating course provides students with a hands-on experience including significant application of AI that could be gained from one of the following:

1. a capstone course,
2. a co-op experience,
3. an approved research experience, or
4. additional advanced coursework.

The program is open to any degree-seeking undergraduate engineering student - including students in Biological Systems Engineering - with a plan of study that fulfills the certificate requirements. Applications can be submitted at any time, but students are encouraged to apply early to ensure a smooth and successful completion of the program.

HOW TO GET IN

HOW TO GET IN

All current undergraduate students in the College of Engineering and in Biological Systems Engineering are eligible to complete the Certificate in Applications of AI in Engineering. Students should submit an online declaration form (https://engineering.wisc.edu/programs/certificates/applications-artificial-intelligence/declaration/).

REQUIREMENTS

REQUIREMENTS

The certificate requires a minimum of 13 credits. Students must complete distinct courses in each requirement; they may not reuse courses to meet multiple requirements.

Code	Title	Credits
Methods and Applications		
Complete at least 9 credits, including at least one Methods course(*)		9
Methods		
E C E 204	Data Science & Engineering (*)	
BSE 380	Introductory Data Science for the Agricultural and Life Sciences (*)	
E C E/COMP SCI/ M E 532	Matrix Methods in Machine Learning (*)	
MATH 535	Mathematical Methods in Data Science (*)	
M E 536	Machine Learning for Data-Driven Engineering Design (*)	
E C E/COMP SCI/ M E 539	Introduction to Artificial Neural Networks (*)	
COMP SCI 540	Introduction to Artificial Intelligence (*)	
CIV ENGR 679	Special Topics in Transportation and City Planning (Topic: AI and Data Science in Transportation (*))	
Applications		
INTEREGR 180	Foundations of Computational Engineering Design	
BSE/AN SCI 344	Digital Technologies for Animal Monitoring	
I SY E 373	Artificial Intelligence (AI) in Systems	
ENVIR ST 403	Special Topics in Environmental Studies (Topic: AI for Sustainability Science)	
BSE 405	Artificial Intelligence in Agriculture	
CIV ENGR 465	Data Sensing and Analysis in Construction	
I SY E 521	Machine Learning in Action for Industrial Engineers	
M S & E 561	Machine Learning in Materials	
CIV ENGR 570	Connected and Automated Transportation Systems	
M E 601	Special Topics in Mechanical Engineering (Topic: AI in Mechanical Engineering)	
I SY E 602	Special Topics in Human Factors (Topic: AI for People)	
Ethics and AI		
Complete one course:		3-4
I SY E 562	Human Factors of Data Science and Machine Learning	
PHILOS 244	Introductory Artificial Intelligence (AI) and Data Ethics [1]	
E C E/I SY E 570	Ethics of Data for Engineers	
Practical Application of AI		
Complete at least one course: [2]		1-3
Capstone Course (Project Approval Required)		
Independent Study (Project Approval Required)		
Co-op Course (Experience Approval Required)		
An additional course from the Methods and Applications list above		
Total Credits		**13-16**

[1] PHILOS 244 Introductory Artificial Intelligence (AI) and Data Ethics is offered as 3 credits in the Summer and 4 credits in the Fall/Spring term.

[2] Students may request to count no more than 3 credits of applied coursework toward the certificate through an optional course experience with AI. This course must be approved by the certificate's

faculty chair in consultation with the certificate's oversight committee. Students must submit a description of their course project, demonstrating application of at least one of the certificate's learning outcomes. Details of the project will be verified with the course instructor. Courses that may qualify include:

- Senior Design Project or Capstone
- Independent Study
- Honors Thesis
- Co-op Course (1 credit)

To submit a request, complete this online course substitution form (https://engineering.wisc.edu/programs/certificates/artificial-intelligence/substitution/). Course substitution requests may be submitted any time, but should be submitted as early as possible once there are sufficient details (such as a course syllabus or a project description) that demonstrate how the course or project aligns with the certificate's learning outcomes.

LEARNING OUTCOMES

LEARNING OUTCOMES

1. Exhibit conceptual understanding of AI functionality
2. Determine the suitability of an AI-based solution to an engineering problem
3. Acquire and apply knowledge of new AI capabilities and AI driven tools
4. Select and employ appropriate AI tools to support solving engineering problems
5. Recognize ethical and professional responsibilities when using AI to solve engineering problems and make informed judgments, which must consider the impact of AI in global, economic, environmental, and societal contexts
6. Communicate with a variety of audiences about use of AI in engineering
7. Demonstrate ability to use AI to solve a real world engineering problem relevant to professional field of interest and critically evaluate the reliability and robustness of the solution