

Artificial Intelligence, Modeling and Simulation in Engineering, Certificate

Requirements

The undergraduate Certificate in Artificial Intelligence, Modeling and Simulation in Engineering (AIMS) requires 18 s.h. Students must maintain a grade-point average of at least 2.00 in coursework specifically for the certificate. The certificate may be earned by any student admitted to the University of Iowa who is not concurrently enrolled in a UI graduate or professional degree program.

Mechanical engineering (ME) students may earn the certificate in AIMS while they complete the design, robotics, and autonomous systems or the manufacturing focus area for their major. In addition, mechanical engineering students may use the certificate as a tailored engineering focus area by adding one eligible course.

Students are strongly encouraged to participate in at least one workshop related to Python, R, or high-performance and parallel computing offered by the Information Technology Services Research Services (ITS-RS) department, and HACKUIOWA organized by the University of Iowa's Hydroinformatics Lab.

Students could petition to substitute certificate courses with artificial intelligence, machine learning, deep learning, and modeling and simulation-related courses offered by ME and other departments. Non-ME students may earn this certificate while completing their degrees without taking extra courses.

The undergraduate certificate in Artificial Intelligence, Modeling and Simulation requires the following coursework.

Required Courses

Students complete one machine learning course and one artificial intelligence course.

Course #	Title	Hours
CS:5430	Machine Learning (may be used as machine learning or artificial intelligence required course)	3
Machine Learning		
One of these:		
ME:4111	Scientific Computing and Machine Learning	3
MATH:3800	Introduction to Numerical Methods	3
Artificial Intelligence		
One of these:		
ME:4150	Artificial Intelligence in Engineering	3
CS:4420	Artificial Intelligence	3

ENGR:3110	Introduction to Artificial Intelligence and Machine Learning in Engineering	3
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Elective Courses

Course #	Title	Hours
Three of these:		
ME:4110	Computer-Aided Engineering	3
ME:4112	Engineering Design Optimization	3
ME:4116	Manufacturing Processes Simulations and Automation	3
ME:4117	Finite Element Analysis	3
ME:4120	Advanced Linear Control Systems	3
ME:4175	Computational Naval Hydrodynamics	3
ME:5143	Computational Fluid and Thermal Engineering	3
ME:5170	Data-Driven Analysis in Engineering Mechanics	3
ME:5300	Uncertainty Quantification and Design Optimization	3
BME:2260	Quantitative Physiology	3
BME:4310	Computational Biochemistry	3
BME:5240	Deep Learning in Medical Imaging (DLMI)	3
BME:5335	Computational Bioinformatics	3
BME:5441	Numerical and Statistical Methods for Bioengineering	3
BME:5525	Cardiopulmonary Design and Modeling	3
BME:5620	Introduction to Applied Biomedical Finite Element Modeling	3
CS:4330	Theory of Computation	3
CS:4350	Logic in Computer Science	3
CS:4700	High Performance and Parallel Computing	3
CS:4720/ MATH:4820	Optimization Techniques	3
CS:5360	Randomized Algorithms	3
CS:5710/ MATH:5800	Numerical Methods I	3
CS:5720/ MATH:5810	Numerical Methods II	3
CS:5810	Formal Methods in Software Engineering	3
MATH:4060	Discrete Mathematical Models	3
MATH:4840	Mathematics of Machine Learning	3

Capstone Course

Students must incorporate aspects of artificial intelligence, machine learning, deep learning, and/or modeling and simulation into their capstone project. Students must submit a written report to the director of the AIMS undergraduate certificate program explaining how they incorporate one or

more of these aspects into their capstone project shortly after completion of the course.

Course #	Title	Hours
One of these:		
ME:4086	Mechanical Engineering Design Project	3
ME:4098	Individual Investigations: Mechanical Engineering	3
BME:4910	Biomedical Engineering Senior Design I	4
BME:4920	Biomedical Engineering Senior Design II	4
CS:5830	Software Engineering Project (requires permission of certificate director)	3
CS:5990	Individualized Research or Programming Project (requires permission of certificate director)	1-3