IOWA | Chemical and Biochemical Engineering

COMPUTATION, DATA SCIENCE, AND MACHINE LEARNING FOCUS AREA

Summary

The computation, data science, and machine learning focus area equips you with the programming, data-analysis, and algorithmic tools used to model, optimize, and automate complex chemical engineering systems. You'll explore areas such as advanced simulation, remote sensing, machine learning, and artificial intelligence, building strong computational and analytical skills. This pathway opens doors to careers in intelligent manufacturing, innovation robotics, machine vision, process automation, and data-driven engineering.

Focus Area Requirements

In addition to the core chemical engineering requirements, you must choose a focus area and complete 12 s.h. towards that focus area. Below are the lists of possible focus area electives that can fulfill this requirement. ***There are multiple options to earn a minor in this degree.*** If you feel another course would fit within this requirement, you must get approval from the departmental undergraduate director to have it count.

Artificial Intelligence: Theory, Methods, and Applications Minor Earned

This minor requires 15 s.h. of courses. These courses can fall within the chemical engineering degree by fulfilling the 12 s.h. of focus area electives, and 3 s.h. of the free elective. See minor for details. Below are recommended courses to complete the minor without additional credit hours needed. To discuss alternative possible routes for this minor, please see your advisor.

Required Focus Area Elective 3 s.h. (pick one from list below)

Offered	Course	s.h.
F/S	ENGR:3110 Intro to AI & Machine Learning in Engr	3

Focus Area Electives 9 s.h. + 3 s.h. Free Elective for Minor (pick from least two categories)

Theory

Offered	Course	s.h.
F	ECE:5200 Machine Learning (P: ECE:2400 or BME:2200)	3
F	ECE:5225 Statistical Foundations of Inference and Machine Learning	3
S	ECE:5240 Deep Learning Theory (P: STAT2020)	3

Methods

Offered	Course	s.h.
	ECE:5215 Applied Machine Learning	3
S	ECE:5250 Large Language Models	3
S	ECE:5485 Intelligent Vision and Image Understanding	3
	Other: AI methods course from another department, approved by ECE Undergraduate Committee	3

Applications		
Offered	**Course**	**s.h.**
F	CBE:5120 Data Science in Chemical and Engineering Systems	3
F/S	ECE:5230 Generative AI Tools: ChatGPT and Beyond	3
S	ECE:5290 Artificial Intelligence: Experiential Learning (P: ENGR2730 + more)	3
S	ECE:5550 Internet of Things (P: ENGR2730)	3
S	ECE:5830 Software Engineering Project (P: ECE:5820)	3
F	ECE:5845 Modern Databases (P: ENGR:2730)	3
	AI applications course from another department, approved by ECE Undergraduate Committee	3

Computer Science Minor Earned

This minor requires 12 s.h. of courses. These courses can fall within the chemical engineering degree by fulfilling the 12 s.h. of focus area electives. See minor for details. Below are recommended courses to complete the minor without additional credit hours needed. To discuss alternative possible routes for this minor, please see your advisor.

Required Focus Area Elective 3 s.h. (pick one from list below)		
Offered	**Course**	**s.h.**
S-EVEN	CS:3210 Programming Languages and Tools	3
F/S	CS:3980 Topics in Computer Science I	3

Focus Area Electives 9 s.h.		
Offered	**Course**	**s.h.**
ALL	CS:2210 Discrete Structures	3
ALL	CS:2230 Computer Science II: Data Structures	3
ALL	CS:3330 Algorithms	3

Other Electives that Align with this Focus Area

In addition to the focus area electives listed above, you will be required to complete the following electives to complete your degree: the Advanced Chemistry Elective (3 s.h.), the Advanced Chemistry Lab Elective, the Advanced Science Elective (3 s.h.), the Engineering Be Creative General Education Elective (3 s.h.), and the Cultural Perspectives, Values, & Society General Education Elective (3 s.h.). ***These do not count toward your focus area electives.*** Below are lists of possible courses to fulfill these requirements that align with this focus area.

Statistics Requirement 3 s.h.		
Offered	**Course**	**s.h.**
S	CBE:3020 Applied Statistics for Chemical and Natural Resources Engineering	3

Advanced Chemistry Elective 3 s.h. (possible courses that align with this focus area)		
Offered	**Course**	**s.h.**
ALL	CHEM 3000+ Level	3

ALL	BMB 3000+ Level	3

Advanced Chemistry Lab Elective 3 s.h. – (possible courses that align with this focus area)

Offered	Course	s.h.
ALL	CHEM:2210 Fundamental of Chemical Measurements Lab	3
ALL	CHEM:2220 Organic Chemistry Lab	3
ALL	CHEM:2240 Organic Chemistry for Majors Lab	3

Advanced Science Elective 3 s.h. – (possible courses that align with this focus area)

Offered	Course	s.h.
S-EVEN	CBE:5425/CEE:5115 Atmospheric Chemistry and Physics	3
F-EVEN	CBE:5315 Polymer Chemistry	3
ALL	See Advanced Science List	3