

# ARTIFICIAL INTELLIGENCE

The MS in Artificial Intelligence program consists of 30 graduate-level semester credit hours, of which 12 are foundation, 9 are concentration, and 9 are elective (including the three options of coursework or project or thesis). A concentration must be declared by admitted students.

The program includes 4 concentrations, in (1) Computer Vision, (2) Machine Learning, (3) Knowledge Management and Reasoning, and (4) Intelligent Interaction. Students must choose one of three options: coursework, MS project, or MS thesis.

The program may be completed entirely on campus, entirely online, or through a combination of on-campus and online courses.

## Requirements

To satisfy the requirements for the MS degree in Artificial Intelligence, all students admitted to the program are expected to complete a minimum of thirty semester hours of graduate coursework, with a cumulative grade point average of B or better. The program of study consists of core courses, concentration courses, and electives with coursework/project/thesis options.

<sup>1</sup>Please contact the Computer and Information Science Department about the policy on the minimum grade for a course to satisfy graduation requirements.

Code	Title	Credit Hours
<b>Required Core (12 credits):</b>		<b>12</b>
CIS 579	Artificial Intelligence	
CIS 581	Computational Learning	
CIS 505	Algorithm Analysis and Design	
CIS 553	Software Engineering	

## Concentrations

Students must choose one concentration (Computer Vision, Intelligent Interaction, Knowledge Management and Reasoning, Machine Learning) and complete 3 courses (9 credits) from the selected concentration.

## Electives and Options

(9 credits): Any course(s) from an MS in AI concentration area(s) outside the student's selected concentration can be an elective course(s). Additionally, the elective course(s) can be drawn from other CECS and partner college courses by faculty advisor or program director approval. The total number of elective courses should be three, including one of three options: (i) Coursework: taking three elective courses; (ii) Project: taking an MS Project by completing a 1-semester project (through the MS Project course in lieu of an elective) and two additional elective courses, or (iii) Thesis: taking an MS Thesis by completing a 2-semester thesis project (through the MS Thesis course in lieu of two electives) and one additional elective course. It is mandatory that the student select one of these three options.

**Option 1: Coursework.** This option requires three elective courses from an MS in AI concentration area(s) outside the student's selected concentration. The minimum requirements for this option are as follows:

- Foundation courses – 12 credit hours
- Concentration courses – 9 credit hours
- Elective courses – 9 credit hours

**Option 2: MS Project.** This option requires a project report describing the results of an independent study project under the supervision of the advisor. The scope of the research topic for the project should be defined in such a way that a full-time student could complete the requirements for a master's degree in 24 months or 6 semesters following the completion of course work by regularly scheduling graduate research credits. The minimum requirements for this option are as follows:

- Foundation courses – 12 credit hours
- Concentration courses – 9 credit hours
- Elective courses – 6 credit hours
- Master's project – 3 credit hours

**Option 3: MS Thesis.** This option requires a research thesis prepared under the supervision of the advisor. The thesis describes a research investigation and its results. The scope of the research topic for the thesis should be defined in such a way that a full-time student could complete the requirements for a master's degree in 24 months or 6 semesters following the completion of course work by regularly scheduling graduate research credits. The minimum requirements for this option are as follows:

- Foundation courses – 12 credit hours
- Concentration courses – 9 credit hours
- Elective courses – 3 credit hours
- Master's Thesis – 6 credit hours

## Concentrations

Select one of the following concentrations and complete 3 courses (9 credits) from the selected concentration:

Code	Title	Credit Hours
<b>Computer Vision Concentration</b>		
Select 3 courses (9 credits) from the following:		9
CIS 515	Computer Graphics	
CIS 551	Advanced Computer Graphics	
CIS 552	Information Visualization and Virtualization	
CIS 652	Advanced Information Visualization and Virtualization	
ECE 577	Engineering in Virtual World	
ECE 585	Pattern Recognition	
ECE 586	Digital Image Processing	
ECE 587	Sel Top:Image Proc/Mach Vision	
ECE 588	Robot Vision	
ECE 5831	Pat Rec & Neural Netwks	
HCDE 530	Information Visualization	

Code	Title	Credit Hours
<b>Intelligent Interaction Concentration</b>		
Select 3 courses (9 credits) from the following:		9
CIS 585	Advanced Artificial Intelligence	
CIS 587	Computer Game Design and Implementation	

CIS 588	Computer Game Design II
CIS 679	Research Advances in Computational Game Theory and Economics
ECE 545	Intro Robot Syst
ECE 544	Mobile Robots
IMSE 548	Res.Meth.Human Fctrs/Ergonomic
IMSE 577	Human-Computer Interaction

Code	Title	Credit Hours
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#### Knowledge Management and Reasoning Concentration

Select 3 courses (9 credits) from the following:	9
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CIS 511	Introduction to Natural Language Processing
CIS 536	Text Mining and Information Retrieval
CIS 540	Foundation of Information Security
CIS 552	Information Visualization and Virtualization
CIS 555	Decision Support and Expert Systems
CIS 568	Data Mining
or ECE 537	Data Mining
CIS 581	Computational Learning
CIS 583	Deep Learning
CIS 585	Advanced Artificial Intelligence
CIS 586	Advanced Data Management
CIS 685	Research Advances in Artificial Intelligence
CIS 5700	Advanced Data Mining
ECE 5001	Analytic and Comp Math
IMSE 510	Probability & Statistical Mod
IMSE 514	Multivariate Statistics

Code	Title	Credit Hours
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#### Machine Learning Concentration

Select 3 courses (9 credits) from the following:	9
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CIS 511	Introduction to Natural Language Processing
CIS 536	Text Mining and Information Retrieval
CIS 581	Computational Learning
CIS 583	Deep Learning
CIS 585	Advanced Artificial Intelligence
ECE 552	Fuzzy Systems
ECE 555	Stochastic Processes
ECE 579	Intelligent Systems
ECE 583	Artificial Neural Networks
ECE 679	Adv Intelligent Sys
IMSE 505	Optimization
IMSE 606	Advanced Stochastic Processes

3. Understand the various ways and reasons humans are integrated into mixed human-AI environments, whether it is to improve overall integrated system performance, improve AI performance or influence human performance and learning.
4. Understand the ethical concerns in developing responsible AI technologies.
5. Implement AI systems, model human behavior, and evaluate their performance.

## Learning Goals

1. Understand representations, algorithms and techniques used across works in artificial intelligence and be able to apply and evaluate them in applications as well as develop their own.
2. Understand and apply machine-learning techniques, in particular to draw inferences from data and help automate the development of AI systems and components.