

# ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING, GRADUATE CERTIFICATE (DEPARTMENT OF COMPUTER SCIENCE)

## Admission Requirements

### Application Deadlines

Application deadlines vary by program, please review the application deadline chart (<http://uwm.edu/graduateschool/program-deadlines/>) for specific programs. Other important dates and deadlines can be found by using the One Stop calendars (<https://uwm.edu/onestop/dates-and-deadlines/>).

### Admission

The minimum GPA for admission is 2.75 in a prior bachelor's or post-baccalaureate degree (or cumulative credits after admission to a dual bachelor-masters degree program). Applicants should generally have a prior degree in science, engineering, computer science, economics, finance or any other area that requires academic preparation in math and programming. Applicants with other prior degrees will also be considered via holistic assessment of the academic record and professional experience, with a focus on substantial work experience in the quantitative analysis, programming, and adequate mathematics preparation for the required coursework.

## Credits and Courses

The Artificial Intelligence and Machine Learning Graduate Certificate requires a minimum of 15 credits, as described below. At least 12 credits must be taken at UWM.

Code	Title	Credits
<b>Required Courses</b>		
COMPSCI/ELECENG 710 or COMPSCI 422G	Artificial Intelligence Introduction to Artificial Intelligence	3
COMPSCI/ELECENG 711 or COMPSCI 411G	Introduction to Machine Learning Machine Learning and Applications	3
COMPSCI 715	Programming for Machine Learning	3
<b>Electives <sup>1</sup></b>		<b>6</b>
<i>Application Electives</i>		
COMPSCI/ELECENG 712	Image Processing	
COMPSCI 720	Computational Models of Decision Making	
COMPSCI 723 or COMPSCI 423G	Natural Language Processing Introduction to Natural Language Processing	
COMPSCI 725	Robot Motion Planning	
COMPSCI 744 or COMPSCI 444G	Text Retrieval and Its Applications in Biomedicine Introduction to Text Retrieval and Its Applications in Biomedicine	
ELECENG 574G	Intermediate Control Systems	

ELECENG 810	Foundations for Advanced Machine Learning and Signal Processing
ELECENG/COMPSCI 811	Advanced Machine Learning
ELECENG 816	Optimal Control Theory
MECHENG 476G	Introduction to Robotics
IND ENG 717	Operations Research in Engineering Management
<i>Generic Electives</i>	
COMPSCI 425G	Introduction to Data Mining
ELECENG 420G	Random Signals and Systems
ELECENG 474G	Introduction to Control Systems
IND ENG 716	Engineering Statistical Analysis
IND ENG 590/890	Topics in Industrial and Systems Engineering: (Introduction to Connected Systems)
IND ENG 590/890	Topics in Industrial and Systems Engineering: (Engineering Data Analytics)

**Total Credits** **15**

<sup>1</sup> Students must enroll in 3 elective courses. At least 2 must be selected from the Applications Electives section, and at least 2 must be at the 700 level or above.

## Additional Requirements

### Transfer Credit

No more than 20% of the required credits may be taken at an institution other than UWM. These courses are subject to Graduate School transfer policy and must be approved by the director of the certificate program.

### Grade Point Average Requirement

A minimum cumulative 3.00 grade point average in certificate courses taken at UWM is required.

### Articulation with Degree Programs

- Credits and courses required for a certificate may double count toward meeting UWM graduate degree requirements subject to the following restrictions:
  - Degree programs must approve the courses from certificates that can double count toward the degree.
  - All credits taken in completion of certificate requirements may count towards a UWM graduate degree as long as they do not contribute more than 90% of the total credits needed to obtain the degree. (Note: Students in PhD programs must still complete the minimum residency requirements)
  - Certificate courses used toward meeting degree requirements must be completed within the time limit for transfer credit.
- Courses completed for a degree may be counted toward a subsequent certificate, subject to all certificate policy requirements.
- A course may count toward no more than one certificate and one degree.
- Students may not earn a certificate subsequent to a concentration in the same area.

## **Time Limit**

Certificate program time limits shall be established as follows:

- 18 or fewer credits/Three years from initial enrollment in the certificate sequence.
- 19 or more credits/Four years from initial enrollment in the certificate sequence.

For certificates that are designed as add-ons to degree programs and are awarded concurrent with the degree, the time limit shall be the same as that of the degree program.