WESTERN GOVERNORS UNIVERSITY
ONLINE. ACCELERATED. AFFORDABLE. ACCREDITED.

Program Guidebook

Master of Science, Computer Science, Artificial Intelligence and Machine Learning

Program Code: **MSCSAIML** Catalog Version: **202504** Published Date: **2/26/2025**

The Master of Science, Computer Science, Artificial Intelligence and Machine Learning program prepares students to meet evolving business needs by applying advanced artificial intelligence, machine learning, and data science methodologies to solve complex, real-world challenges. Students will develop expertise in AI algorithms, deep learning, and natural language processing (NLP) to create innovative solutions for diverse industries. In addition to designing scalable systems and implementing secure software development practices, students will focus on business applications, optimizing AI technologies to drive decision-making and operational efficiency. Graduates will be equipped with strong technical communication skills and ethical AI development practices, enabling them to lead interdisciplinary teams and deliver impactful solutions that align with business objectives.

Understanding the Competency-Based Approach

How do competency-based programs like those offered at Western Governors University (WGU) work? Unlike traditional universities, WGU does not award degrees based on completing a certain number of credit hours or a specific set of required courses. Instead, you will earn your degree by demonstrating your skills, knowledge, and understanding of essential concepts.

Progress through a degree program is measured not by the amount of time you spend in class but by your ability to demonstrate competency as you complete required courses along a Standard Path. To help you acquire the knowledge and skills you need to demonstrate competency and complete your courses and program, WGU provides a rich array of learning resources. Your program mentor will work closely with you to help you understand your program's requirements and help you create a plan for completing your courses. You will also work closely with course instructors as you engage in each course. As subject matter experts, course instructors will guide you through the content you must learn to demonstrate competency through the course assessments.

The benefit of this competency-based system is that it enables students who are knowledgeable about a particular subject to make accelerated progress toward completing a degree, even if they lack college experience. You may have gained skills and knowledge of a subject while on the job, accumulated wisdom through years of life experience, or already taken a course on a particular subject. WGU will award your degree based on the skills and knowledge you possess and can demonstrate—not the number of hours spent in a classroom.

Accreditation

Western Governors University is the only university in the history of American higher education to have earned initial accreditation from multiple regional accrediting commissions at once—earning simultaneous accreditation from ACCJC, HLC, NWCCU, and WASC. The university’s accreditation from the Northwest Commission on Colleges and Universities (NWCCU) was reaffirmed in March of 2024. In addition to institution-level accreditation, each school has at least one program that is accredited by a programmatic accreditation. All programmatic accreditations are managed by the Academic Engagement department. Contact compliance@wgu.edu for additional information.

The Degree Plan

The focus of your program is your personalized Degree Plan. The Degree Plan is a detailed blueprint of the courses you will need to complete in order to earn your degree. The Degree Plan also lays out the accompanying learning resources and assessments that compose your program. The list of courses in the Degree Plan is often referred to as the standard path. The amount of time it takes to complete your program depends on both the amount of new information you need to learn and the amount of time you plan to devote each week to study. Your program mentor and course instructors will help you assess your strengths and development needs to establish a study plan.

Students vary widely in the specific skills and information they need to learn. For example, some students may be highly knowledgeable in a particular subject matter and would not need to engage in new learning opportunities. Other students may find that portions of the program require them to learn new information and that they need to take an online class or participate in a study module to acquire the knowledge and skills needed to fulfill program competencies in that area. Some individuals may be able to devote as little as 15–20 hours per week to the program, while others may need to devote more time. For this reason, pre-assessments are there to help your program mentor form a profile of your prior knowledge and create a personalized Degree Plan.

How You Will Interact with Faculty

At WGU, faculty serve in specialized roles, and they will work with you individually to provide the guidance, instruction, and support you will need to succeed and graduate. As a student, it is important for you to take advantage of this support. It is key to your progress and ultimate success.

Upon your enrollment, you will be assigned a program mentor—an expert in your field of study who will provide you with regular program-level guidance and support from the day you start until the day you graduate. Your program mentor will set up regular telephone appointments (weekly at first) with you, which you will be expected to keep. The mentor will review program competencies with you and work with you to develop a plan and schedule for your coursework. Your program mentor will serve as your main point of contact throughout your program—helping you set weekly study goals, recommending specific learning materials, telling you what to expect in courses, and keeping you motivated. In addition to regular calls, your program mentor is available to help you resolve questions and concerns as they arise.

For many of the courses at WGU, you will be required to complete performance assessments. These include reports, papers, presentations, and projects that let you demonstrate your mastery of the required competencies. A separate group of faculty members, called evaluators, will review your work to determine whether it meets requirements. Evaluators are also subject matter experts in their field of evaluation. If your assessment needs further work before it “passes,” these evaluators, who review your work anonymously, will provide you with instructional feedback to help you meet evaluation standards and allow you to advance.

Connecting with Other Mentors and Fellow Students

As you proceed through your Degree Plan, you will have direct contact with multiple faculty members. These communications can take a variety of forms, including participation in one-on-one discussions, chats in the learning communities, and live cohort and webinar opportunities. As a WGU student, you will have access to your own personal MyWGU Student Portal, which will provide a gateway to your courses of study, learning resources, and learning communities where you will interact with faculty and other students.

The learning resources in each course are specifically designed to support you as you develop competencies in preparation for your assessments. These learning resources may include reading materials, videos, tutorials, cohort opportunities, community discussions, and live discussions that are guided by course instructors who are experts in their field. You will access your program community during your orientation course to network with peers who are enrolled in your program and to receive continued support through professional enrichment and program-specific chats, blogs, and discussions. WGU also provides Student Services associates to help you and your program mentor solve any special problems that may arise.

Orientation

The WGU Orientation course will introduce you to the fundamentals of WGU’s competency-based education (CBE) and the expectations, policies, and protocols for students enrolled in a WGU degree program. Orientation will introduce you to WGU’s wide range of support resources and success centers. It also will provide you with study strategies recommended by current students and faculty that will help you succeed as a WGU student. Orientation ends with your first assessment at WGU, providing an opportunity to experience WGU’s performance assessment process before you begin your degree-focused coursework. The Orientation course must be completed before you can start your first term at WGU.

Transferability of Prior College Coursework

Because WGU is a competency-based institution, it does not award degrees based on credits but rather on demonstration of competency. WGU undergraduate programs may accept transfer credits or apply a 'Requirement Satisfied' (RS) in some cases. Refer to your specific program transfer guidelines to determine what can be satisfied by previously earned college credits. Students entering graduate programs must have their undergraduate degree transcripts verified before being admitted to WGU. In addition to a program's standard course path, there may be additional state-specific requirements.

Click here for the Student Handbook

WGU does not waive any requirements based on a student's professional experience and does not perform a "résumé review" or "portfolio review" that will automatically waive any degree requirements. Degree requirements and transferability rules are subject to change in order to keep the degree content relevant and current.

Remember, WGU's competency-based approach lets you take advantage of your knowledge and skills, regardless of how you obtained them. Even when you do not directly receive credit, the knowledge you possess may help you accelerate the time it takes to complete your degree program.

Continuous Enrollment, On Time Progress, and Satisfactory Academic Progress

WGU is a "continuous enrollment" institution, which means you will be automatically enrolled in each of your new terms while you are at WGU. Each term is six months long. Longer terms and continuous enrollment allow you to focus on your studies without the hassle of unnatural breaks between terms that you would experience at a more traditional university. At the end of every six-month term, you and your program mentor will review the progress you have made and revise your Degree Plan for your next six-month term.

WGU requires that students make measurable progress toward the completion of their degree programs every term. We call this "On-Time Progress," denoting that you are on track and making progress toward on-time graduation. As full-time students, graduate students must enroll in at least 8 competency units each term, and undergraduate students must enroll in at least 12 competency units each term. Completing at least these minimum enrollments is essential to On-Time Progress and serves as a baseline from which you may accelerate your program. We measure your progress based onthe courses you are able to pass, not on your accumulation of credit hours or course grades. Every time you pass a course, you are demonstrating that you have mastered skills and knowledge in your degree program. For comparison to traditional grading systems, passing a course means you have demonstrated competency equivalent to a "B" grade or better.

WGU assigns competency units to each course in order to track your progress through the program. A competency unit is equivalent to one semester credit of learning. Some courses may be assigned 3 competency units while others may be as large as 12 competency units.

Satisfactory Academic Progress (SAP) is particularly important to students on financial aid because you must achieve SAP in order to maintain eligibility for financial aid. We will measure your SAP quantitatively by reviewing the number of competency units you have completed each term. In order to remain in good academic standing, you must complete at least 66.67% of the units you attempt over the length of your program—including any courses you add to your term to accelerate your progress. Additionally, during your first term at WGU you must pass at least 3 competency units in order to remain eligible for financial aid. We know that SAP is complex, so please contact a financial aid counselor should you have additional questions. *Please note: The Endorsement Preparation Program in Educational Leadership is not eligible for federal financial aid.

Courses

Your Degree Plan includes courses needed to complete your program. To obtain your degree, you must demonstrate your skills and knowledge by completing each course's assessment(s). You may be asked to demonstrate competency in a course in several different ways, including proctored exams, projects, essays, research papers, and simulations, among others. Certifications verified through third parties may also be included in your program as a way to demonstrate competency. More detailed information about each assessment is provided in the course of study.

Learning Resources

WGU works with many different educational partners, including enterprises, publishers, training companies, and higher educational institutions, to provide high-quality and effective learning resources that match the competencies you are developing. These vary in type, and may be combined to create the best learning experience for your course. A learning resource can be an e-textbook, online module, study guide, simulation, virtual lab, tutorial, or a combination of these. The cost of most learning resources are included in your tuition and Resource Fee. They can be accessed or enrolled for through your courses. Some degree-specific resources may not be covered by your tuition, and you will need to cover those costs separately. WGU also provides a robust library to help you obtain additional learning resources, as needed.

Mobile Compatibility:

The following Student Handbook article provides additional details about the current state of mobile compatibility for learning resources at WGU.

Mobile Access for Learning Resources

Standard Path

As previously mentioned, competency units (CUs) have been assigned to each course in order to measure your academic progress. If you are an undergraduate student, you will be expected to enroll in a minimum of 12 competency units each term. Graduate students are expected to enroll in a minimum of 8 competency units each term. A standard plan for a student for this program who entered WGU without any transfer units would look similar to the one on the following page. Your personal progress can be faster, but your pace will be determined by the extent of your transfer units, your time commitment, and your determination to proceed at a faster rate.

Standard Path *for* Master of Science, Computer Science, Artificial Intelligence and Machine Learning

Course Description	CUs	Term
Formal Languages Overview	3	1
Computer Architecture and Systems	3	1
Applied Algorithms and Reasoning	3	1
Unix and Linux	3	2
Artificial Intelligence and Machine Learning Foundations	3	2
Governance, Risk, and Compliance	2	2
Machine Learning for Computer Scientists	4	3
Deep Learning	3	3
Natural Language Processing	3	3
Advanced AI for Computer Scientists	4	4
Total CUs	31	

Changes to Curriculum

WGU publishes an Institutional Catalog, which describes the academic requirements of each degree program. Although students are required to complete the program version current at the time of their enrollment, WGU may modify requirements and course offerings within that version of the program to maintain the currency and relevance of WGU's competencies and programs. When program requirements are updated, students readmitting after withdrawal from the university will be expected to re-enter into the most current catalog version of the program.

Areas of Study for Master of Science, Computer Science, Artificial Intelligence and Machine Learning

The following section includes the areas of study in the program, with their associated courses. Your specific learning resources and level of instructional support will vary based on the individual competencies you bring to the program and your confidence in developing the knowledge, skills, and abilities required in each area of the degree. The Degree Plan and learning resources are dynamic, so you need to review your Degree Plan and seek the advice of your mentor regarding the resources before you purchase them.

Computer Science

Formal Languages Overview

Formal Languages Overview introduces students to programming language design and theory, focusing on formal semantics and type systems. It covers imperative, functional, and parallel languages, emphasizing techniques for proving language properties and verifying program specifications. Students will differentiate between functional and procedural languages, and explore compiled, interpreted, query, and assembly languages. The course also examines the structure and features of programming languages, including object-oriented programming principles. Learners will understand program correctness, testing, and verification, addressing type correctness. This course prepares students to assess programming languages against business requirements, enhancing software reliability and efficiency. Aimed at those interested in the theoretical underpinnings of programming languages, it equips students with knowledge to make informed decisions in software development and application.

This course covers the following competencies:

- *Begin your course by discussing your course planning tool report with your instructor and creating your personalized course plan together.*
- *The learner applies techniques for proving language properties and verifying program specifications to enhance the reliability and efficiency of software.*
- *The learner explains the history, formal semantics, and type systems for different programming language types.*

Computer Architecture and Systems

Computer Architecture and Systems offers a comprehensive examination of the design and development of computer systems. Students will explore the evolution of computer architecture, understanding how computers have advanced and changed over time. The course covers different layouts and designs used in both hardware and software solutions, helping students to grasp the complex structures of computer systems. Students will learn how to develop detailed plans for implementing computing solutions that work across various platforms. The course likewise covers how to integrate various devices to ensure they operate and communicate smoothly with each other.

This course covers the following competencies:

- *Begin your course by discussing your course planning tool report with your instructor and creating your personalized course plan together.*
- *The learner analyzes the evolution of computer architecture and systems.*
- *The learner designs system architectures that integrate hardware and software components.*
- *The learner recommends hardware/software solutions that operate seamlessly across multiple device platforms.*

Applied Algorithms and Reasoning

This course builds on foundational knowledge of algorithm design and optimization for efficient resource utilization. It emphasizes benchmarking algorithms, reasoning, and applying Big O notation for performance evaluation. This course will cover how to design, analyze, and implement algorithms to solve complex computational problems, focusing on optimizing performance and enhancing system efficiency. The practical applications in this course involve testing data structures, developing algorithmic solutions, and optimizing algorithm performance through critical analysis and implementation. By integrating computational thinking and engineering principles, this course will present the skills students need to develop and optimize algorithms for real-world software, using benchmarking and profiling tools to measure and enhance performance.

This course covers the following competencies:

- *Begin your course by discussing your course planning tool report with your instructor and creating your personalized course*

plan together.

- *The learner designs algorithms to optimize performance and resource utilization for various computational tasks.*
- *The learner implements diverse algorithmic techniques to solve complex computational problems.*
- *The learner optimizes algorithm performance through analysis and implementation enhancements.*

Unix and Linux

Unix and Linux offers a comprehensive introduction to these operating systems, focusing on essential skills used in system administration and development roles. This course equips students with the ability to employ the most common commands, navigate the Unix/Linux shell, manage files and directories, configure the shell environment, and create shell scripts to automate routine tasks. This hands-on approach prepares students to competently manage and maintain Unix and Linux systems in real-world applications. There are no prerequisites for this course.

This course covers the following competencies:

- *Begin your course by discussing your course planning tool report with your instructor and creating your personalized course plan together.*
- *The learner applies Unix commands for common tasks.*
- *The learner creates shell scripts to automate routine tasks.*
- *The learner describes how to navigate and manage files and directories within the Unix shell.*
- *The learner evaluates ways to manage and configure the Unix shell environment.*

Artificial Intelligence and Machine Learning Foundations

Artificial Intelligence and Machine Learning Foundations explores foundational concepts and practical applications of artificial intelligence (AI) and machine learning (ML). It provides students with an understanding of the historical context and evolution of AI and the subsequent growth phases of AI technologies. This course will investigate the computational theories and logical frameworks that have shaped the AI landscape, examining how advancements in hardware have enabled the leap from basic ML to the complexities of deep learning. The course emphasizes the practicalities of AI and ML and gives insights into the critical role of data integrity and the techniques for data wrangling to feed into ML algorithms effectively. In addition to the technical skills, the course incorporates the societal implications of AI and ML, discussing current ethical considerations. This course aims to create a nuanced understanding of AI and ML, preparing students to thoughtfully consider the broader impacts of these technologies. There are no prerequisites for this course.

This course covers the following competencies:

- *Begin your course by discussing your course planning tool report with your instructor and creating your personalized course plan together.*
- *The learner analyzes artificial intelligence and machine learning capabilities.*
- *The learner applies artificial intelligence and machine learning algorithms to solve diverse real-world problems.*
- *The learner evaluates the ethical implications of artificial intelligence and machine learning technologies.*
- *The learner optimizes artificial intelligence systems for enhanced performance and efficiency.*
- *The learner prepares data for use in machine learning.*

Machine Learning for Computer Scientists

Machine Learning for Computer Scientists provides a comprehensive introduction to foundational machine learning algorithms and their applications, aligned with the AWS Certified Machine Learning—Specialty (MLS-C01). The course covers supervised learning techniques such as linear regression, logistic regression, decision trees, and support vector machines, as well as unsupervised learning methods like clustering and dimensionality reduction. Essential concepts in model evaluation, selection, and optimization are also covered, including cross validation, hyperparameter tuning, and ensemble methods. Designed specifically for computer scientists, this course sets the groundwork for advanced studies in deep learning and natural language processing. This course teaches students machine learning (ML) techniques of supervised and unsupervised ML methods using Python programming language.

This course covers the following competencies:

- *Begin your course by discussing your course planning tool report with your instructor and creating your personalized course plan together.*

- *The learner applies machine learning techniques to solve complex problems.*
- *The learner evaluates machine learning models, applying criteria for model selection and optimization.*
- *The learner implements machine learning models for predictions and decision-making.*

Deep Learning

Deep Learning delves into the fundamental principles, underlying mathematics, and implementation details of deep learning. The curriculum is designed to provide a robust understanding of the core concepts and methodologies essential for optimizing highly parameterized models. Key topics include gradient descent, backpropagation, and the broader framework of computation graphs. The course explores the essential modules that constitute deep learning models, such as linear, convolution, and pooling layers, along with various activation functions. The course also covers common neural network architectures, including convolutional neural networks (CNNs) and recurrent neural networks (RNNs), equipping students with the skills needed to design, implement, and optimize advanced deep learning systems. Through hands-on projects and practical applications, the course prepares students to gain the expertise to tackle real-world challenges using deep learning techniques.

This course covers the following competencies:

- *Begin your course by discussing your course planning tool report with your instructor and creating your personalized course plan together*
- *The learner analyzes the performance of deep learning models.*
- *The learner applies neural network architectures for deep learning.*
- *The learner applies techniques to optimize deep learning models.*

Natural Language Processing

Natural Language Processing offers an in-depth exploration of modern data-driven techniques for natural language processing (NLP). The course progresses from basic text preprocessing methods to advanced machine-learning (ML) models specifically tailored for NLP tasks. Topics include sentiment analysis, named entity recognition, machine translation, and the use of advanced neural network architectures such as recurrent neural networks (RNNs), long short-term memory (LSTM), and transformers. Industry-standard tools and frameworks are covered for practical applications and project-based learning. For successful completion of this course, learners should take AI and ML Foundations, Machine Learning for Computer Scientists, and Deep Learning prior to this course.

This course covers the following competencies:

- *Begin your course by discussing your course planning tool report with your instructor and creating your personalized course plan together.*
- *The learner applies natural language processing techniques for text analysis and generation tasks.*
- *The learner implements natural language processing techniques to analyze and process text data.*
- *The learner optimizes natural language models.*

Advanced AI for Computer Scientists

Advanced AI for Computer Scientists synthesizes principles of artificial intelligence (AI) and machine learning (ML) to equip students with the skills needed to design sophisticated AI systems that address real-world problems. The course explores cutting-edge techniques such as meta-learning, zero-shot and few-shot learning, and advanced ensemble methods. The course also covers state-of-the-art deep-learning architectures, reinforcement-learning strategies, and probabilistic-reasoning models. Additionally, the course prepares students to critically evaluate AI systems for performance, efficiency, sustainability, and ethical considerations, ensuring a comprehensive understanding of advanced AI applications.

This course covers the following competencies:

- *Begin your course by discussing your course planning tool report with your instructor and creating your personalized course plan together.*
- *The learner applies probabilistic reasoning and AI techniques for enhanced problem-solving capabilities.*
- *The learner critically evaluates AI systems to improve performance, efficiency, and sustainability.*
- *The learner prepares data for use in AI model training.*
- *The learner synthesizes principles of artificial intelligence and machine learning to design systems that solve real-world*

problems.

Risk Management

Governance, Risk, and Compliance

Governance, Risk, and Compliance provides learners with advanced skills and knowledge to authorize and maintain information systems utilizing various risk management frameworks. The course focuses on the strategic and long-term alignment of an organization's information security program to regulatory requirements and organizational policies. Course topics include compliance and regulatory requirements, data classification and prioritization, security and privacy controls, compliance audits and remediation, and risk management plans.

This course covers the following competencies:

- *Begin your course by discussing your course planning tool report with your instructor and creating your personalized course plan together.*
- *The learner develops a remediation plan for security and privacy compliance issues.*
- *The learner evaluates a system security plan in line with business organizational strategy and regulatory compliance requirements...*

Accessibility and Accommodations

Western Governors University (WGU) is committed to providing equal access to its academic programs to all qualified students. WGU's Student Disability Services department supports this mission by providing support, resources, advocacy, collaboration, and academic accommodations in accordance with federal and state statutes and regulations to WGU students and prospective students. Potential and current students needing to request accommodation(s) are encouraged to contact Student Disability Services to initiate the request. To initiate the accommodation process, all potential and current WGU students must complete the secure online Accommodation Request Form located at' *https://www.wgu.edu/wgu/ada_form*. Potential and current students can reach the Student Disability Services team Monday through Friday 8:00 a.m. to 5:00 p.m. MT at 1-877- 435-7948 x5922 or at *sds@wgu.edu*. Additional information on accommodations can be found in the student handbook Accommodations for Students with Disabilities policy.

Need More Information? WGU Student Services

Student Support Services team members also assist with unresolved concerns to find equitable resolutions. To contact the Student Support Services team, please feel free to call 877-435-7948 or e-mail *studentservices@wgu.edu*. We are available Monday through Friday from 6:00 a.m. to 10:00 p.m., and Saturday and Sunday, 10:00 a.m. to 7:00 p.m, mountain standard time.