Artificial Intelligence Major Curriculum

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Major Description

Artificial intelligence applies computer science to problems once thought solvable only by humans. The replication of human general intelligence has long been a goal of the field, but today's practical AI applications are automated systems that are domain specific, enhancing or replacing human labor. The study of AI at the undergraduate level includes a grounding in computer science and mathematics as well as courses in data science, machine learning, and advanced search and optimization algorithms. The Artificial Intelligence major also emphasizes ethical thinking and experiential learning through the development of applied AI systems. Graduates will be prepared to apply AI methods responsibly as software engineers in evolving fields such as healthcare, business, and the creative arts.

Program Learning Outcomes

Algorithmic Problem Solving

Solve problems within computer science and in other domains using computational tools.

Ethical Collaboration & Technical Communication

Work on integrated teams to deliver software grounded in ethical conduct and an understanding of computing's societal impacts. Be able to explain technical concepts to a variety of stakeholders.

Systems Thinking

Understand how the multiple layers of the hardware and software stack work in concert to support modern applications.

Analytical and Mathematical Reasoning

Apply mathematical and logical reasoning, including discrete mathematics and statistics, to analyze computational problems.

Data Engineering

Collect, clean, and manage large data sets, and design pipelines that support training and deployment of AI systems.

Machine Learning

Design and evaluate machine learning models that adapt and improve through training on real-world data.

Required Courses

Course Code	Name	Pre-Requisites	Credits
CSC 141	Foundations of Computer Science I	None	4
CSC 142	Foundations of Computer Science II	CSC 141	4
CSC 210	Data Structures & Algorithms	CSC 142, MAT 250 co-req	3
CSC 280	Computer Ethics	CSC 141, 30 College Credits	3
CSC 300+	Advanced Computer Science Elective	Varies	3
CSC 382	Computer Science Internship	CSC 210	3
CSC 480	Introduction to Artificial Intelligence	CSC 210, MAT 110	3
MAT 110	Elementary Statistics	None	3
MAT 131	Calculus and Analytical Geometry I	None	4
MAT 250	Foundation of Mathematics	MAT 131	3
MAT 320	Linear Algebra	MAT 131, MAT 250	3
CSC 390	Data Science	CSC 142, MAT 110	3
CSC 481	Machine Learning	CSC 480, MAT 320, CSC 390	3
CSC 482	Deep Learning	CSC 481	3
CSC 483	Advanced Topics in AI	CSC 481	3
CSC 493	Artificial Intelligence Capstone	CSC 481, 90 College Credits	4
			52

Yellow = Same as Computer Science Major

Required Courses' Descriptions

CSC 141 Foundations of Computer Science I

This is an introduction to problem-solving methods and algorithm development as well as the fundamental building blocks of programs including control structures, loops, functions, and simple data structures. The objective is to teach how to design, code, debug and document programs using techniques of good programming style. Binary and fundamental data types are also discussed.

4 Credits, Pre-Requisite: None

CSC 142 Foundations of Computer Science II

This course builds on Foundations of Computer Science I, continuing the development of discipline in program design, style and expression while expanding it to object-oriented programming. It focuses on debugging and testing; and introduces basic aspects of recursion and simple class hierarchies. Specific object-oriented topics include polymorphism, encapsulation, abstraction, modularity, and inheritance.

4 Credits, Pre-Requisite: CSC 141

CSC 210 Data Structures & Algorithms

A study of data structures and algorithms, their practical applications, and key techniques for designing, analyzing, and reasoning about them with an emphasis on comparative efficiency utilizing Big O notation. Students implement data structures and algorithms from scratch in addition to studying their theoretical properties. Topics include lists, stacks, queues, hash tables, recursion, searching and sorting, binary trees, and graphs.

3 Credits, Pre-Requisite: CSC 142 and co-requisite of MAT 250

CSC 280 Computer Ethics

Students analyze ethical issues in the software industry using both theoretical ethics frameworks as well as a modern lens. The relationship between technology and economics, culture, and human rights is a particular focus. Specific topics include but are not limited to intellectual property, open source software, privacy, work culture, social media, automation, algorithmic decision making, AI ethics, and bias. Multiple sides are illuminated through extensive discussion classes and student-led debates.

3 Credits, Pre-Requisite: CSC 141 and 30 College Credits

CSC 300+ Advanced Computer Science Elective

Descriptions Vary

3 Credits, Pre-Requisite: Varies

CSC 382 Computer Science Internship

Students will apply computer science in a professional context (e.g. business, institution, government agency, or significant open source project) under the supervision of a staff member and a faculty sponsor. Reports and tangible project results are required. Students

must obtain faculty approval of their internship prior to the start of the semester.
3 Credits, Quality/Non-quality only, Prerequisite: CSC 210

CSC 480 Introduction to Artificial Intelligence

A broad survey of artificial intelligence (AI) including important algorithms and problem-solving techniques from across the history of AI. The course covers both traditional AI/search algorithms as well as an introduction to the basics of machine learning. Specific topics/algorithms covered include A*, constraint satisfaction problems, genetic algorithms, minimax, KNN, linear regression, gradient descent, naïve bayes, k-means clustering, and an elementary introduction to neural networks. A few interspersed discussion classes highlight historical and ethical issues.

3 Credits, Pre-Requisite: CSC 210, MAT 110

MAT 110 Elementary Statistics

This course gives students a general overview of modern statistics. Topics include: organization of data; probability and probability distributions; measures of central tendency and variability; normal distributions; sampling; hypothesis testing; correlation and regression.

3 Credits, Pre-Requisite: None

MAT 131 Calculus and Analytical Geometry I

This course involves fundamental concepts of functions of one variable. Topics include: limits, continuity, differentiation, derivative applications, curve sketching, related rates, and maxima-minima problems. Introduction to indefinite and definite integration including the fundamental theorems, and numerical approximation techniques are also covered.

4 Credits, Pre-Requisite: None

MAT 250 Foundation of Mathematics

This is an introduction to abstract and discrete mathematics. Topics include symbolic logic, methods of proof (direct, contradiction, and induction), set theory, relations and functions, graph theory (graphs, trees, Euler and Hamiltonian cycles, search algorithms), countable and uncountable sets.

3 Credits, Pre-Requisite: MAT 131

MAT 320 Linear Algebra

This is an introduction to matrix algebra, linear equations, linear independence, determinants, vector spaces, linear transformations, eigenvalues, eigenvectors, and diagonalization.
3 Credits, Prerequisite: MAT 131, MAT 250

CSC 390 Data Science

This course introduces the essential techniques of data science including data gathering, data storage, data cleaning, data analysis, and data visualization. Modern tools and programmatic manipulation of data are emphasized. A core outcome is the ability to prepare and transform real-world datasets for subsequent use in machine learning algorithms.
3 Credits, Prerequisite: CSC 142, MAT 110

CSC 481 Machine Learning

Building on the introduction to machine learning in CSC 480, this course examines advanced machine learning algorithms and techniques for parameter tuning and validation. Projects are built using real data sets that allow students to compare different algorithmic approaches. The course includes a strong introduction to multi-layer neural networks and their applications, equipping students to evaluate, compare, and apply modern machine learning methods to complex problems.
3 Credits, Prerequisite: CSC 480, MAT 320, CSC 390

CSC 482 Deep Learning

This course advances the study of multi-layer neural networks through exploration of diverse layer types, configurations, and training techniques. Advanced architectures such as convolutional networks and transformers are introduced, along with an introduction to reinforcement learning. Hands-on projects emphasize how different architectures are suited to different classes of problems, preparing students to design, implement, and evaluate deep learning models for real-world applications.
3 Credits, Prerequisite: CSC 481

CSC 483 Advanced Topics in AI

This rotating topics course explores advanced areas of artificial intelligence, with specific subjects varying based on student interest and faculty availability. The course assumes a strong background in AI fundamentals, including machine learning. Potential topics include, but are not limited to, computer vision, natural language processing, the development of large language models, and topics from traditional AI approaches such as search. Students will engage with contemporary research and applications, gaining deeper

expertise in specialized areas of the field.
3 Credits, Prerequisite: CSC 481

CSC 493 Artificial Intelligence Capstone

Students work in small teams on the production of a significant tangible software project that can serve both as a culminating experience and a portfolio piece. In addition to writing the software, students complete an extensive report including their background research, an analysis of any ethical or legal issues related to their project, the architecture and design of their project, and connections between their project and other disciplines. Prototyping and data engineering best practices are required.

4 Credits, Prerequisite: CSC 481 and 90 Credits

Example Student Progression

	Fall	Spring
Year 1	CSC 141 Foundational of Computer Science I MAT 131 Calculus and Analytical Geometry I	CSC 142 Foundations of Computer Science II MAT 250 Foundation of Mathematics
Year 2	CSC 210 Data Structures & Algorithms MAT 110 Elementary Statistics	CSC 390 Data Science MAT 320 Linear Algebra
Year 3	CSC 480 Introduction to Artificial Intelligence CSC 280 Computer Ethics	CSC 481 Machine Learning CSC 300+ Computer Science Elective
Year 4	CSC 482 Deep Learning CSC 382 Computer Science Internship	CSC 483 Advanced Topics in AI AI 492 Artificial Intelligence Capstone