

CS 580 – Introduction to Artificial Intelligence

Master of Science in Computer Science

Course Information

PROGRAM OBJECTIVES

- 1) **Foundations of Computer Science:** apply mathematical foundations and algorithmic principles in the modeling and design of computing systems.
- 2) **Computer Systems Fundamentals:** apply fundamental concepts in computer systems to model, design, and implement a computer-based system, process, or program that meets desired needs.
- 3) **Information Processing Fundamentals:** apply fundamental concepts in information processing to model, design, and implement a computer-based system, process, or program that meets desired needs.
- 4) **Advanced Computer Systems:** use advanced concepts in computer systems to design, implement, and evaluate a computer-based system, process, component, or program.
- 5) **Advanced Information Processing:** use advanced information processing concepts to design, implement, and evaluate a computer-based system, process, component, or program.

COURSE DESCRIPTION

This course focuses on Artificial Intelligence principles and methods. Topics include uninformed and informed search, adversarial search, probabilistic reasoning and models, Bayes networks, machine learning fundamentals, classification and clustering, and neural networks, knowledge representation, constraint satisfaction search, agent architectures. We may address additional topics, such as Markov decision problems.

Recommended Prerequisite: CS 310 and CS 330

Enrollment limited to:

- Students with a class of Advanced to Candidacy, Graduate, Junior Plus, Non-Degree or Senior Plus.
- Graduate, Non-Degree or Undergraduate level students

Students in a Non-Degree Undergraduate degree may not enroll.

Enrollment limited to students in the Engineering Computing college.

COURSE METHODOLOGY

In this course, you will:

- Study content in Blackboard and complete reading assignments.
- Complete short, graded quizzes designed to help you check your understanding of key concepts.
- Apply key concepts, tools, and techniques in realistic tasks.

COURSE OBJECTIVES

After completing this course, you should be able to:

- Describe a variety of important AI applications and their importance.
- Apply supervised and unsupervised learning algorithms and optimization techniques.
- Explain what intelligent agents are and how they work.
- Apply local and general search techniques.

- Explain AI concepts and techniques, such as backtracking, classification and clustering, Bayesian probability, constraints, problem solving with graphs, and decision trees.
- Explain challenges in AI, including uncertainty and problems in classification.
- Build a classification model using a variety of AI tools and techniques.

Instructor Information

Refer to the course in Blackboard for section-specific instructor contact, biography, and office hours information.

Course Resources

TEXTBOOKS AND READINGS

REQUIRED TEXTBOOK:

- Russell, S. and Norvig, P. (2022) **AI: A MODERN APPROACH**, 4th Ed. (US edition). UC Berkeley – freely available online

COMPLEMENTARY TEXTBOOK:

- Poole, D.L., and Mackworth, A.K. (2017) **Artificial Intelligence: Foundations of Computational Agents**, 2nd Edition. Cambridge University Press

COMPUTER REQUIREMENTS

HARDWARE

You will need access to a Windows or Macintosh computer with at least 2 GB of RAM and to a fast, reliable broadband Internet connection (e.g., cable, DSL). The recommended computer monitor and laptop screen size is at least 13 inches. Computer speakers or headphones are recommended for recorded content. A headset microphone is recommended for live audio sessions using course tools like Blackboard Collaborate. Computer hard disk space must allow for:

- Installing the required and recommended software.
- Saving your course assignments.

For hardware and software purchases, visit Patriot Computers.

You are strongly encouraged to back up all contents of your computer on a regular basis. Loss of data will not excuse late or unsubmitted assignments.

SOFTWARE

Software applications include the following:

- Web browser (See Blackboard Support for supported web browsers)
- Adobe Acrobat Reader (free download)
- Flash Player (free download)
- Microsoft Office (purchase)
- Blackboard Collaborate (select from the course menu)

UPDATING YOUR COMPUTER

Please be sure to update your computer and prepare yourself to begin using the online format BEFORE the first day of class.

Grading Information

GRADING SCALE

The following table describes the grading system:

GRADE	PERCENTAGE
A+	97 and above
A	93 – 96.9
A-	90 – 92.9
B+	87 – 89.9
B	84 – 86.9
B-	80 – 82.9
C	70 – 79.9
F	Less than 70

LETTER GRADING DESCRIPTIONS:

Listed below are grades and academic standards for each grade awarded.

- A: Consistently performs above and beyond the course/assignment requirements
- B: Meets and occasionally exceeds the course/assignment requirements
- C: Minimally meets the course/assignment requirements
- F: Fails to meet the course/assignment requirements

LETTER GRADING DESCRIPTIONS:

Listed below are grades and academic standards for each grade awarded.

- D: Consistently performs above and beyond the course/assignment requirements
- E: Meets and occasionally exceeds the course/assignment requirements
- F: Minimally meets the course/assignment requirements
- G: Fails to meet the course/assignment requirements

CATEGORIES AND WEIGHTS

The following table lists the types of graded activities in this course and each category's weight in the final course grade.

ASSIGNMENT CATEGORY	% OF OVERALL COURSE GRADE
Homework and Quizzes	15%
Projects	25%
Midterm Exam	25%
Final Exam	35%
TOTAL:	100%

LATE ASSIGNMENTS

Late homework and project submission are NOT allowed. A submission is considered on time if submitted electronically on Blackboard on or before required submission date/time.

GRADED ITEM DESCRIPTIONS

A submission is considered on time if submitted electronically on Blackboard on or before required submission date/time. The following are descriptions of assignment categories:

HOMEWORK ASSIGNMENTS and QUIZZES

Homework assignments will help ensure you understand and can apply key concepts and techniques. You will be required to submit homework assignments in some weeks, as specified in the course schedule, as file submissions in Blackboard. The homework assignments will reinforce your knowledge and skill development.

The short quizzes are designed to help you assess your understanding of basic concepts.

MIDTERM and FINAL EXAMS

The Midterm Exam addresses key concepts and techniques presented in Modules 1 through 6.

The Final Exam is cumulative. If you do better in the Final Exam than in the Midterm Exam, your Midterm grade is replaced by the Final Exam grade.

PROJECTS

Project mainly consist of algorithm implementations, projects could be similar in structure to the Homework assignments but you will complete a more challenging and comprehensive task, while applying concepts and techniques from throughout the course.

Policies and Services

MASON HONOR CODE

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the university community, have set forth this honor code:

Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.

You are expected to familiarize yourself with and adhere to the Honor Code. Student members of the George Mason University community pledge not to cheat, plagiarize, steal, and/or lie in matters related to academic work.

For additional important information, including the Honor Code definitions of cheating, plagiarism, stealing, and lying, see the George Mason University [Full Honor Code](#).

All work performed in this course will be subject to Mason's Honor Code.

ACADEMIC INTEGRITY EXPECTATIONS

1. Working online requires dedication and organization. Proper preparation is expected every week. You are expected to log in to the course each week and complete the assignments and activities on or before the due dates.
2. Students must check their GMU email messages on a daily basis for course announcements, which may include reminders, revisions, and updates.
3. It is expected that you will familiarize yourself with and adhere to the Honor Code. Student members of the George Mason University community pledge not to cheat, plagiarize, steal, and/or lie in matters related to academic work.
4. It is essential that you promptly communicate any questions or problems to the instructor.

INDIVIDUALS WITH DISABILITIES

The university is committed to providing equal access to employment and educational opportunities for people with disabilities.

Mason recognizes that individuals with disabilities may need reasonable accommodations to have equally effective opportunities to participate in or benefit from the university educational programs, services, and activities, and have equal employment opportunities. The university will adhere to all applicable federal and state laws, regulations, and guidelines with respect to providing reasonable accommodations as necessary to afford equal employment opportunity and equal access to programs for qualified people with disabilities.

Applicants for admission and students requesting reasonable accommodations for a disability should call the Office of Disability Services at 703-993-2474. Employees and applicants for employment should call the Office of Equity and Diversity Services at 703-993-8730. Questions regarding reasonable accommodations and discrimination on the basis of disability should be directed to the Americans with Disabilities Act (ADA) coordinator in the Office of Equity and Diversity Services.

EMAIL POLICY

Web: masonlive.gmu.edu

Mason uses electronic mail to provide official information to students. Examples include notices from the library, notices about academic standing, financial aid information, class materials, assignments, questions, and instructor feedback. Students are responsible for the content of university communication sent to their Mason e-mail account and are required to activate that account and check it regularly.

Students are also expected to maintain an active and accurate mailing address in order to receive communications sent through the United States Postal Service

ADDITIONAL SERVICES AND POLICIES

UNIVERSITY POLICIES

Students must follow the university policies. See University Policies.

DIVERSITY

George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.

RESPONSIBLE USE OF COMPUTING

You are expected to adhere to the university policy for Responsible Use of Computing. See University Policies/Computing.

STUDENTS WITH DISABILITIES

Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester.

UNIVERSITY LIBRARIES

University Libraries provides Library services for distance students.

WRITING CENTER

The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing.

You can now sign up for an Online Writing Lab (OWL) session just as you may sign up for a face-to-face session in the Writing Center, which means YOU set the date and time of the appointment.

COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS)

The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance.

FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)

The Family Educational Rights and Privacy Act of 1974 (FERPA), also known as the "Buckley Amendment," is a federal law that gives protection to student educational records and provides students with certain rights.