Course Outline: CS 690 004 | ME 585 | ECE 585
Human-Robot Interaction

Spring 2026

Wednesdays from 4:30 pm to 7:10 pm
PLANET 120

Course Overview

Introduction to the theory, principles, and methods used to model, design and test automated, autonomous or robotic systems that require or support human interaction. Focus areas include understanding the theory and mechanics of both human and robot perception and cognition, the design of interaction architectures such as teleoperation and human supervisory control, and how to conduct principled tests and experiments of human-robot systems.

Prerequisite: Graduate student standing

Instructor Name(s) and Contact Information

David Porfirio, Ph.D.
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Office: FUSE 7310
Office Hours: by appt.

Learning Outcomes

This course intends to introduce you to the fundamentals of human-robot interaction, with a focus on how theory, methods, and tools all contribute to this emerging field. We will also discuss systems level issues such as legal and sociotechnical implications particularly as these relate to complex human-robot systems. After taking this class, you should be able to:

- Understand the core limitations and strengths of both humans and robots and the implications of these on role and function allocation and system design.
- Understand the difference between teleoperation, supervisory control, and interactive teaming in human-robot systems.
- Understand how fundamental concepts from fields such as machine learning, artificial intelligence, and psychology relate to human-robot interaction.
- Discuss the differences in various brain-computer interfaces and how these could be used as control interfaces to robotic systems.
- Understand the emerging issues in social robotics as well as the importance of accounting for (dis)trust in robotic systems.
- Identify strengths and weaknesses in the design of virtual and augmented reality systems and what their implications are for control of robotic systems
- Develop a test and evaluation plan for a human-robot system.
- Understand the social, legal, and potential policy challenges associated with the design and introduction of human-robot systems.

Course Website

Course materials will be hosted on Canvas, including readings, assignment descriptions, and lecture slides. Students should refer to Canvas for any schedule updates, which may affect the syllabus. The syllabus on Canvas will be kept up-to-date.

Code will be hosted here: https://github.com/dporfirio/GMU_CS690_HRI

Course Project

Over the course of the term, students will work individually or in small groups (no more than 2 students) on a final project. This project is intended to either 1) tie directly to the student's graduate research or 2) represent a domain need matched with student interest. Students will submit brief final project proposals by the end of the 6th week of class. As a method of standardization, groups of students will be held at higher standards than students working individually.

There is an entry point in human-robot interaction for ***everybody***, whether you are an engineer, computer scientist, psychologist, artist, sociologist, lawyer, etc. One main barrier to entry is time, so you will need to scope your project with the instructor. Some ideas for projects are below:

- **Technical**—construction of a find-and-fetch algorithm for the Stretch robot.
- **System**—creation of a novel teleoperation/control system.
- **Analysis**—Forensic analysis of a current/former system (e.g., Sophia, driverless cars, Asimo, ...).
- **Experimentation**—Comparing social cues between two separate robot platforms.
- **Other**—pitch any topic to the instructor.

Each project will be peer reviewed in the context of final project presentations. All final projects will be presented via a poster session on the last day of class. A final project critique is due by the beginning of final exams.

Texts

Readings will be provided via the course website or through links on the syllabus.

Case Studies

At the beginning of every class, two students will brief the class one the assigned readings, one reading per student, each for no more than 5 minutes. No digital devices will be allowed, *i.e.,* students will simply discuss the big idea in each paper and whether they agree with the results and interpretations.

Course Schedule

Readings and assignments will be posted on the course website. The instructor reserves the right to modify the schedule during the semester as needed.

Date	Topic
1/21/2026	Introduction and Survey of HRI Applications
1/28/2026	Information Processing for Humans and Robots
2/4/2026	Decision Theory: Humans & Robots
2/11/2026	Natural Language Processing & Large Language Models in Robotic Applications
2/18/2026	Cognitive and Human Performance Models **Assignment 1 due:** accident report analysis
2/25/2026	Automation, Autonomy, and AI in Robotic Systems **Project milestone due:** initial project topic
3/4/2026	Design

Date	Topic
3/11/2026	Spring Break—No Class
3/18/2026	Ethics, Law & Policy for Robots **Guest lecturer:** Dr. Jesse Kirkpatrick
3/25/2026	Testing & Experimentation **Assignment 2 due:** object identification analysis
4/1/2026	MARC Day
4/8/2026	Robots & Risk Management **Assignment 3 due:** test plan
4/15/2026	Interfaces & Social Robotics
4/22/2026	HRI Teaming **Assignment 4 due:** safety audit
4/29/2026	Poster Presentations
5/6/2026	No class—**written evaluations of posters due and final papers due**

Grading Policy

Grading Schema

A	92%	B+	87%	C+	77%	D	60%	F	<60%
A-	90%	B	83%	C	72%				
		B-	80%	C-	67%				

Grade Weights

- Assignments (4) – 12% each
- Project – 30%, see description below
- Project evaluation – 10% (each student will provide a comprehensive constructive written analysis of one other person's project)
- Participation – 12% (this will usually be 1% per attendance per day, though some days may be weighted more heavily than others)

Late Assignment Policy—at the discretion of the instructor, starting immediately after the due date & time, late assignments will be docked 10%, with an additional 10% docked for each late day thereafter. For example, if an assignment is 8 hours late, because it is within the first 24 hours, it will be docked 10%. If it is 36 hours late, because it is within the first 48 hours, it will be docked 20%. 50 hours late means 30% docked. Etc.

Attendance Policy—students must sometimes miss class, especially in graduate courses. Students who inform the instructor at least 1 week in advance of missing class will not be penalized. Other cases will be evaluated at the discretion of the instructor.

AI Policy

Generative AI is an important tool for students to learn how to use, so the use of AI in this course is allowed in some cases, and prohibited in others.

What is allowed: AI is allowed to be used in certain technical aspects of this course, such as for your final project. You are *encouraged* to document any use of AI for transparency.

What is prohibited with some exceptions: The use of generative AI for writing assignments, including poster creation. All writing must be your own. Having AI complete a writing assignment on your behalf will be treated similarly to having a peer write

the assignment for you. However, there are some acceptable uses of involving AI in writing assignments, similar to acceptable uses of involving a peer in writing assignments: brainstorming ideas, identifying gaps or errors in your drafts, and proofreading.

Essentially, your writing should be your own, but just like how it is sometimes okay to ask others for brainstorming or proofreading help, you can use generative AI to brainstorm or clean things up.

All other uses of generative AI in this course are prohibited.

Consequences of misuse: misuse of AI, including improperly citing or documenting use, may result in a reduction in assignment grades, and in severe cases will be treated as plagiarism or academic dishonesty.

Academic Standards

Academic Standards exist to promote authentic scholarship, support the institution's goal of maintaining high standards of academic excellence, and encourage continued ethical behavior of faculty and students to cultivate an educational community which values integrity and produces graduates who carry this commitment forward into professional practice.

As members of the George Mason University community, we are committed to fostering an environment of trust, respect, and scholarly excellence. Our academic standards are the foundation of this commitment, guiding our behavior and interactions within this academic community. The practices for implementing these standards adapt to modern practices, disciplinary contexts, and technological advancements. Our standards are embodied in our courses, policies, and scholarship, and are upheld in the following principles:

- **Honesty:** Providing accurate information in all academic endeavors, including communications, assignments, and examinations.
- **Acknowledgement:** Giving proper credit for all contributions to one's work. This involves the use of accurate citations and references for any ideas, words, or materials created by others in the style appropriate to the discipline. It also includes acknowledging shared authorship in group projects, co-authored pieces, and project reports.
- **Uniqueness of Work:** Ensuring that all submitted work is the result of one's own effort and is original, including free from self-plagiarism. This principle extends to written assignments, code, presentations, exams, and all other forms of academic work.

Violations of these standards—including but not limited to plagiarism, fabrication, and cheating—are taken seriously and will be addressed in accordance with university policies. The process for reporting, investigating, and adjudicating violations is outlined in the university's academic standards procedures. Consequences of violations may include academic sanctions, disciplinary actions, and other measures necessary to uphold the integrity of our academic community.

The principles outlined in these academic standards reflect our collective commitment to upholding the highest standards of honesty, acknowledgement, and uniqueness of work. By adhering to these principles, we ensure the continued excellence and integrity of George Mason University's academic community.

Student responsibility: Students are responsible for understanding how these general expectations regarding academic standards apply to each course, assignment, or exam they participate in; students should ask their instructor for clarification on any aspect that is not clear to them.

Accommodations for Students with Disabilities

Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit the Disability Services website for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu. Phone: (703) 993-2474.

Student responsibility: Students are responsible for registering with Disability Services and communicating about their approved accommodations with their instructor in advance of any relevant class meeting, assignment, or exam.

FERPA and Use of GMU Email Addresses for Course Communication

The Family Educational Rights and Privacy Act (FERPA) governs the disclosure of education records for eligible students and is an essential aspect of any course. **Students must use their GMU email account** to receive important University information, including communications related to this class. Instructors will not respond to messages sent from or send messages regarding course content to a non-GMU email address.

Student responsibility: Students are responsible for checking their GMU email regularly for course-related information, and/or ensuring that GMU email messages are forwarded to an account they do check.

Title IX Resources and Required Reporting

As a part of George Mason University's commitment to providing a safe and non-discriminatory learning, living, and working environment for all members of the University community, the University does not discriminate on the basis of sex or gender in any of its education or employment programs and activities. Accordingly, **all non-confidential employees, including your faculty member, have a legal requirement to report to the Title IX Coordinator, all relevant details obtained directly or indirectly about any incident of Prohibited Conduct** (such as sexual harassment, sexual assault, gender-based stalking, dating/domestic violence). Upon notifying the Title IX Coordinator of possible Prohibited Conduct, the Title IX Coordinator will assess the report and determine if outreach is required. If outreach is required, the individual the report is about (the "Complainant") will receive a communication, likely in the form of an email, offering that person the option to meet with a representative of the Title IX office.

For more information about non-confidential employees, resources, and Prohibited Conduct, please see University Policy 1202: Sexual and Gender-Based Misconduct and Other Forms of Interpersonal Violence. Questions regarding Title IX can be directed to the Title IX Coordinator via email to TitleIX@gmu.edu, by phone at 703-993-8730, or in person on the Fairfax campus in Aquia 373.

Student opportunity: If you prefer to speak to someone ***confidentially***, please contact one of Mason's confidential employees in Student Support and Advocacy (SSAC), Counseling and Psychological Services (CAPS), Student Health Services (SHS), and/or the Office of the University Ombudsperson.