

DES638 – Human-Machine Interaction

Instructor: Dr. Gowdham Prabhakar

Department of Design, IIT Kanpur

Credits: 9 | **Semester:** Odd 2025

Class Type: Lecture + Lab-Based Exploration

Goal: To prototype and exhibit original interaction systems in **HMI Horizon**

What is this course about?

This course explores **how humans and machines can communicate, collaborate, and co-create** through multisensory and intelligent systems. You will learn how to build and evaluate novel interfaces—from assistive tech to interactive art—by working hands-on with sensors, software, and creative tools.

Think **eye tracking, gesture interfaces, haptics, XR, musical interaction, AI-assisted tools**—and how these can enable more meaningful, accessible, and expressive human experiences.

Learning Outcomes

By the end of this course, you will:

- Understand core HMI principles and emerging modalities
 - Learn to build interfaces using sensors, electronics, and software
 - Ideate and prototype interaction systems across physical and virtual spaces
 - Evaluate your work through user feedback and design critique
 - Present your work in a public showcase: **HMI Horizon**
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Course Structure: 3 Phases

Phase	Focus	Weeks
Part 1	Exploring Interaction Modalities & Tools	1–5
Part 2	Ideation, Teaming, Domain Choice	6–9
Part 3	Prototyping, Testing & Final Showcase	10–14

Domains You Can Explore (Not Limited To)

- Assistive Interfaces for Accessibility
- Embodied & Sonic Interaction
- Human-AI Co-Creation

- XR/VR/AR Experience Design
 - Smart Urban Interaction
 - Tangible & Wearable Interfaces
 - Human-Music Interaction (Music Technology)
 - Artistic Installations & Performative Tech
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Tools You Might Use (Not Limited To)

- Sensors: Eye Tracker, Hand Tracker, EMG, Breath sensors
- Platforms: Arduino, Raspberry Pi, ESP32
- Programming: Python, Unity, Unreal, Blender, TouchDesigner, MediaPipe
- Prototyping: CAD, 3D Printing, motors, LEDs, speakers
- AI/ML: RunwayML, Teachable Machine, OpenCV, LLM, VLM, Custom models

You **do not need to know these tools upfront**—we'll guide you in selecting and learning what's needed based on your project.

Assignments & Projects

- **Mini Labs & Case Study** (10%)
- **Concept Brief + Team Proposal** (10%)
- **Design Critique Participation** (10%)
- **Final Project: Prototype + Display** (40%)
- **Documentation & Process Journal** (20%)
- **Final Viva & Demo Jury** (10%)

We grade **your process, creativity, and critical thinking** more than the polish of the final product.

What is HMI Horizon?

HMI Horizon is our final public showcase where you will **present your project prototypes**. It's a celebration of design, technology, and new interactions—open to faculty, students, and invited guests. Think of it as your **demo day + portfolio night**.

Who Should Take This Course?

- Designers, engineers, artists, or researchers curious about interaction design
- Students with interest in **tangible systems, creative coding, accessibility, or AI**
- No prior experience with electronics or coding is mandatory—just a **willingness to explore and build**

What to Expect in Week 1

- An overview of Human-Machine Interaction
- Examples from HIVE Lab's latest projects
- Case study prompts
- Open call for domain interests
- Forming ideas for your final project

Workshops (Optional, Based on Need)

- Electronics Basics (Arduino, sensors)
- Unity/Unreal for XR Development
- TouchDesigner for Visual Interaction
- MaxMSP/Supercollider/Logic Pro/FL Studio for Music Tech
- Machine Learning for Designers
- CAD & 3D Printing for HMI

Communication

We'll use [**email** / **WhatsApp** / **Discord** / **Teams**] for updates. Please check regularly.
Office hours: By appointment / Weekly open session.

Final Note from Instructor:

“This course is a space for exploration. Choose problems that matter to you. Work with modalities that excite you. Build for impact—or build for joy. Let's prototype the future together.”