

Where Robotics Meets Human Need — Build Technology That Empowers People







What Is This Course?

EECE 5552 is a graduate course exploring how robots can assist, augment, and rehabilitate humans. You will study human–robot interaction, wearable exoskeletons, musculoskeletal simulation, computer vision, and teleoperation — culminating in a hands-on capstone lab with professional-grade robot hardware.

Hardware Platforms

-  UR12e 6-DOF Collaborative Arm
-  Robotiq Hand-E Adaptive Gripper
-  EduExo Elbow Exoskeleton
-  PincherX-100 Desktop Arm
-  IMU & EMG Sensors
-  Arduino Microcontrollers

Software & Methods

-  ROS2 & PolyScope Programming
-  MediaPipe Vision Tracking
-  OpenSim Musculoskeletal Model
-  RTDE Real-Time Data Exchange
-  EMG Signal Processing
-  Shared Autonomy Concepts

Lab Sequence

-  Lab 1 · UR12e Operation & Safety
-  Lab 2 · 3D Print & Fabrication
-  Lab 3 · EduExo Sensor-Actuator
-  Lab 4 · Computer Vision Control
-  Lab 5 · OpenSim Simulation
-  Lab 6 · Capstone Teleoperation

What You Will Do

Wire EMG & IMU sensors onto the EduExo exoskeleton and interpret real-time biopotential signals

Run OpenSim musculoskeletal simulations to compare muscle loads with and without an exoskeleton

Implement RTDE teleoperation interfaces — DualShock controller, VR headset, or leader arm

3D-print and fabricate custom exoskeleton components with CAD and Prusa MK4S printers

Build a MediaPipe computer-vision pipeline to control the UR12e arm via hand pose detection

Collaborate in teams on a capstone lab integrating all hardware and software platforms



Capstone Teleoperation Lab

In Lab 6, your team integrates everything — UR12e arm, EduExo, webcam vision, and your chosen input device — to build a working assistive teleoperation system and demonstrate it live.

Deliverables: Lab notebooks · Design report · Oral defense

Prerequisites

Graduate admission or instructor permission
Basic programming experience (Python/MATLAB)

Who Should Enroll?

ECE, ME, or CS graduate students
Anyone passionate about assistive tech & HRI