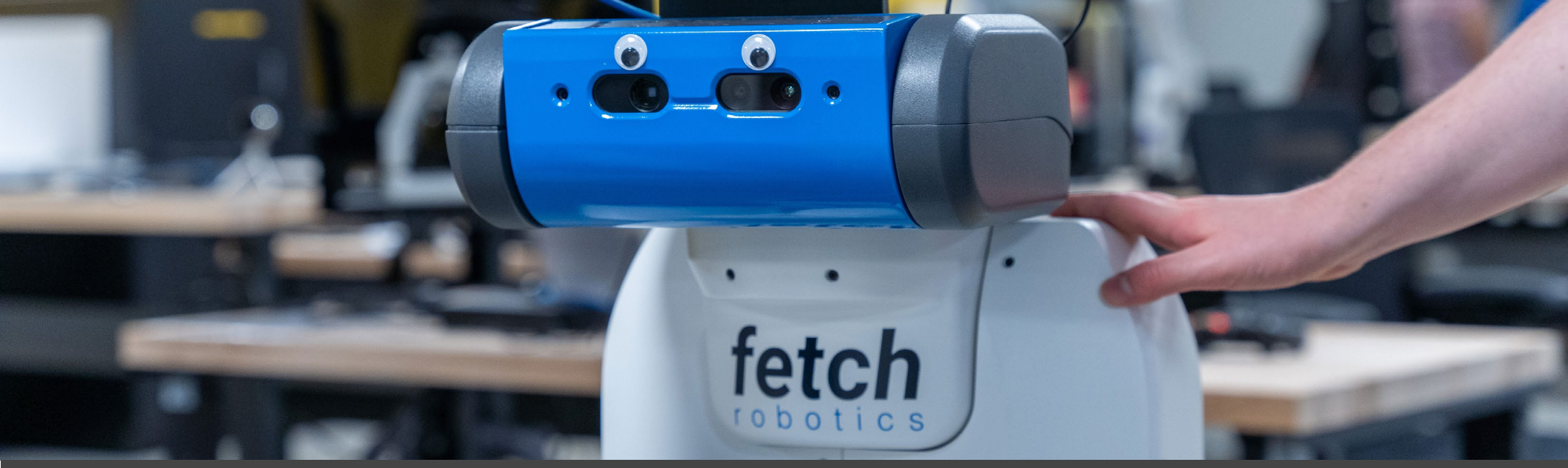

TECHIN 516/7: ROBOTIC SENSING & HUMAN/ROBOT INTERACTION LABS

Robots are taking on increasing roles in warehouses, homes, and healthcare. Learn how to program mobile robots to navigate in real-world environments, as well as how to perceive the world and manipulate items while working together with humans in human/robot-interaction. Robots used in these courses include: Turtlebot3, Fetch Mobile Manipulator, and Kinova Gen3Lite arms. The interdisciplinary Master of Science in Technology Innovation (MSTI) robotics labs will be taught in-person in the studio classrooms and Prototyping Labs of the Global Innovation Exchange facility in Bellevue.

TECHIN516: ROBOTICS LAB 1 ROBOTIC SENSING AND MOBILITY (4CR, WINTER QUARTER 2022)

Learn three introductory areas of robotics while learning how to use the Robot Operating System (ROS):

- General overview: robotic configurations, applications, sensors, actuators, control, and real-world expectations of robotic components
- Autonomous mobile robots: kinematics of mobile robots, localization and mapping, motion planning, and autonomous navigation
- Robotic arms: forward/inverse kinematics, trajectory generation, and grasping/manipulation

Each week the course is presented in three ways:

- Robotics theory that introduces and explores various concepts of robotics. Some of this time may be used to provide an overview connection with the practical labs.
- Offline reading list of required and optional text that provides further background on concepts covered in the course.
- Hands-on lab work where students use ROS to explore the concepts covered by the course. The students will be exposed to a mix of environments including Gazebo simulations, operation of a real robot (Turtlebot3), and working with Kinova arms (Gen3Lite and Gen3 Research).

Learning Objectives
Students completing the course successfully will be able to:

- Name and diagram the parts of a robotic mobility hardware/software system identifying at least specific: Runtime/OS elements (e.g. ROS Nodes), sensors, actuators, and environmental interactions
- Program a robot to navigate to a goal while avoiding obstacles
- Understand the fundamentals underlying motion planning and manipulation (grasping)

Pre-reqs: Basic understanding of Linux (Ubuntu), basic understanding of Linear Algebra, CSE142 and CSE143, MATH125

TECHIN517: ROBOTICS LAB 2 DESIGNING ROBOTS FOR HUMAN ENVIRONMENTS (4CR, SPRING QUARTER 2022)

The field of human/robot interaction (HRI) is rapidly emerging as a significant interdisciplinary research area that focuses on developing robotic technologies and interfaces that enable robots to effectively work with and alongside people. This course will introduce students to robotic design theory, principles, methodologies, and applications by bringing together knowledge from robotics, artificial intelligence, human factors, human-computer interaction, design, education, and other domains. Coursework will include conceptual discussions focused on the state-of-the-art in robotics research, focused team design, and development exercises working towards a team project comprising both implementation and evaluation of a human/robot interaction system for specific applications.

The following topics will be covered during the 10 weeks of the course:

- Introduction to robotics and their applications
- Sensing and robot state
- Introduction to kinematics/actuators and control
- Mobile kinematics/localization and mapping
- Motion planning and autonomous navigation
- Robotic arms, forward and inverse kinematics
- Motion planning and trajectory generation
- Grasping and manipulation
- Computer vision for robotic perception

Learning Objectives
Students completing the course successfully will be able to:

- Discuss design considerations and frameworks for human-centered robotics architecture
- Program a Fetch robot to perform goal-oriented tasks
- Implement and demonstrate understanding of perception, motion planning, manipulation, and grasping

Pre-reqs: This course assumes students previously took TECHIN516: Robotics Lab 1, Robotic Sensing and Mobility

LEARN MORE

Contact Dr. John Raiti (jraiti@uw.edu) if you have any questions, to learn more about the courses, or for registration approval. Visit www.msti.washington.edu to learn more about the M.S. in Technology Innovation program.