

# Special Topics Courses

RBE 595 Special Topics courses are arranged by individual faculty with special expertise, these courses survey fundamentals in areas that are not covered by the regular Robotics Engineering course offerings. Courses are not always offered each semester.

## **RBE 595 courses offered in Fall 2022:**

### **Haptic and Robotic Interaction (In-Person)**

The course is focused on studying how to detect and simulate physical interaction between two entities (for example, between a robot and an object, or between two objects) in a virtual environment, motivated by applications in haptics, where a human operator interacts with virtual objects via a haptic display device. Applications range from virtual training for a wide range of tasks that require physical interaction with objects, such as dental and surgical operations, to teleoperation of robotic manipulation tasks through haptics, and dynamic simulation. Multi-region collisions and contacts involving both rigid and deformable objects will be addressed.

### **Sensor Fusion and Perception for Autonomous Vehicles (Online)**

This course focuses on Sensor Fusion, Image Processing and Computer Vision techniques for Autonomous Vehicles. The class covers four topics: Image Processing (Image Enhancement, Filtering, Advanced Edge and Texture), 2D/3D Vision (3D Geometry from Multiple view geometry, Motion Processing and Stereo) Sensor fusion (homogeneous fusion, heterogeneous fusion and sensor integration) and Image Segmentation and Object Recognition. Students will be introduced to several existing software toolboxes from Vision and Robotics, and will implement a number of smaller projects. Moreover, this course presents a variety of tools and approaches for solving fundamental problems involving sensor fusion and perception. Topics to be covered include the mathematical formulation of fusion algorithms, the use of sensor fusion to solve visual perception degeneracies, time domain discrepancies, and accurate reconstruction, and the design and implementation of heterogeneous sensor fusion approaches. Prerequisite: RBE 500.