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:

Space and Planetary Robotics (In-Person)

Space and Planetary Robotics course provides historical overview, addresses state of the art and discusses potential future directions of robotics applied to orbiting and voyaging spacecraft technologies and instrumentation, planetary landers and rovers, service, construction and industrial, autonomous and semi-autonomous, conventional and possibly self-replicating robotic systems within non-Earth based settlements, as well as human augmentation systems in the context of space and planetary exploration. This course is intended for graduate students and advanced undergraduate students. This is term long course. There is no prerequisite for this course. However, it is recommended that this course is taken in conjunction with either courses within minor in Astrophysics, or courses within minor in Aerospace Engineering, or select courses in Engineering Science and Aerospace Engineering such as: ES2501 Introduction to Static Systems, ES2503 Introduction to Dynamic Systems, AE2713 Astronautics, AE4713 Spacecraft Dynamics and Control, or select courses in Robotics such as RBE1001 Introduction to Robotics, the four course series RBE2001, 2002, 3001 and 3002.

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 involve both rigid and deformable objects will be addressed.

Sensor Fusion and Perception for Autonomous Vehicles (Online)

This course focuses in 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 degeneratives, time domain discrepancies, and accurate reconstruction, and the design and implementation of heterogeneous sensor fusion approaches. Prerequisite: RBE 500.