

ROS and ROBOTICS

COURSE: **CENG 5435-01/4391-02 FALL 2022 24201/24294**
Syllabus, Learning Outcomes, Honesty

Undergraduates will have one less assignment and a different scoring for the class project.

Class: Monday 7-9:50 Delta D158B

INSTRUCTOR: Dr. Thomas L. Harman, harman@uhcl.edu,
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OFFICE HOURS: E-mail harman@uhcl.edu

PREREQUISITES: Graduate Standing

DESCRIPTION: This class will teach the basics of the Robot Operating System (ROS).
We will cover both ROS1 and ROS2.

BOOK REQUIRED: *ROS Robotics By Example 2nd Edition*, Fairchild and Harman,
ISBN 9781788479592 (See Harman Website)

<https://www.packtpub.com/hardware-and-creative/ros-robotics-example-second-edition>

Lecture materials will be supplemented by computer exercises using the Robot Operating System ROS and the simulation software “Gazebo”.



Baxter

There will be homework and examinations. In addition to regular homework and examinations, a project report will be due at the end of the semester. The WEB will be used for many of our references.

GRADING: The grade will be divided roughly as follows:

Exams and Quizzes	45%
Homework	30%
Project and presentation*	25%

The project will consist of a design with documentation for a application of our robotic system serving some useful purpose. The presentation will consist of a brief lecture and report on the project at the end of the semester.

NOTE: The project can be used as preparation for the Capstone course or a thesis.

CENG 5435 Course Outline

(Tentative – **Changes with interest of the students and changes in Technology**)

Material to be covered

Introduction the class and to the Robot Operating System with Videos and Lectures

Introduction to the ROS Software Driving many robots today

Open Source Software for the Operating System

Architecture of the Robot Operating Systems

Details of the Robot Operating System

Examples using Comparison of ROS1 and ROS2
(Chapter 1 in Text with updates)

Creating you own Robot (Chapter 2 in Text) with updates

Driving a Robot and Navigating the World with ROS

Generally following Chapter 3 and 4 in the Text.

Creating a Robot Arm

Details of the Baxter-ROS Interface Examples using Baxter and its Simulator

Study of Baxter's Sensors and Cameras

Baxter Examples and Programs including Vision examples

During the semester there will be discussions about the projects and an examination.

Due: BRIEF ORAL AND WRITTEN SUMMARY OF PROJECT.

MIDTERM EXAMINATION

Advanced Navigation and TurtleBots

More ROS examples - Robots Flying

MATLAB and ROS

ROS Future – ROS2 Advanced Features for Communication, Security, and Real-time control.

DUE: PROJECT DEMONSTRATIONS AND REPORTS – Night of Final.

Learning Outcomes CENG 5435

Understand the various types and capabilities of Robots using ROS1 and ROS2.

Understand how a robot's component parts are used in applications.

Describe the mechanical parts of a robot and their characteristics.

Understand how a robotic system is controlled and how the control parameters are measured or acquired using ROS.

Describe the sensors of a robot and their characteristics for various applications. Learn how ROS allows simple interface to the sensors.

Be able to design a project to use a robot in an application.

Understand the features and capability of ROS1 and ROS2 in applications.

Write a project report according to the directions and give presentations in class.

Honesty

The Academic Honesty Policy at UHCL (found in the University of Houston-Clear Lake Catalog) states: Academic honesty is the cornerstone of the academic integrity of the university.

It is the foundation upon which the student builds personal integrity and establishes a standard of personal behavior.

Because honesty and integrity are such important factors in the professional community, you should be aware that failure to perform within the bounds of these ethical standards is sufficient grounds to receive a grade of "F" in this course and be recommended for suspension from UHCL.

The Honesty Code of UHCL states "I will be honest in all my academic activities and will not tolerate dishonesty."

- Academic Honesty Code – A suggested statement: The Academic Honesty Code states "*I will be honest in all my academic activities and will not tolerate dishonesty*" and is detailed on pages 77-80 of the 2008-2009 Catalog. Online at: <http://www.uhcl.edu/XDR/Render/catalog/06/#A0213>

Accommodations (as specified by the Americans with Disabilities Act) - Suggested statement: If you will require special academic accommodations, please contact the [Disability Services Office](#) at 281-283-2627.

Academic Honesty Code: see section 2.1.4 in this handbook for the UHCL Academic Honesty Code.