ISDN2601 (L1) - Exploring the World through Sm art Mechatronics (Fall 23-24)

Course Description

This course provides an introductory experience into the design and application of smart mechatronic systems on building integrative systems. Students will learn how smart integrative systems are built to sense and interact with humans and the environment, to serve everyday real-world needs. The course includes fundamental theory and practical hands-on labs and projects for the student to acquire the basic knowledge of designing mechatronic systems, using embedded system to control and practice design thinking process. In the lab sessions, students design and build a succession of mechatronic subsystems, leading to an integrated system in a final project. Lecture topics include embedded system design, basic electronics, use of sensors and actuators, system modelling, measurement and control, and appreciation of the impact of smart mechatronics system in solving real-world problems. In the final project, students will apply design thinking approach to meet the project requirements, specified from users' perspective.

Learning Outcomes

- Describe how an embedded system work
- Learn the basics of electrical circuits and electronic devices
- Learn how to program an embedded system and how the software and hardware work together
- Learn the basics of sensor and actuator theory and able to design sensor circuits for simple applications
- Learn the theoretical and practical aspects of measurement system design, system modelling and control system design
- Gain hands-on experience in designing and constructing basic mechatronic systems as well implementing the control algorithms using embedded system
- Appreciate how mechatronic systems solve the real-world problem

Textbook

Introduction to Mechatronics and Measurement Systems, 4th edition by D.Alciatore and M. Histand, McGraw-Hill, 2012.

Labs Outline

Six labs will be held in group size of 2-3.

1. Embedded Systems Basic – Setting up and embedded programming

2. Implementing simple controller with embedded processors
3. Data acquisition and signal filtering
4. Sensor modules
5. PWM generation and motor control
6. PID motion control

Grading Scheme

- Class participation 5%
- Written assignments 15%
- Labs and Labs assignment 30%
- Midterm Test 20%
- Final Project 30%