

Digital & Embedded Systems

ENSC3020/ELEC4403

Semester Group Project **Autonomous Boat**

weeks 6-12

- GROUPS:** Teams of 4 students
- EQUIPMENT:** Purchase your own equipment,
up to \$50 will be reimbursed (receipts required)

GET STARTED

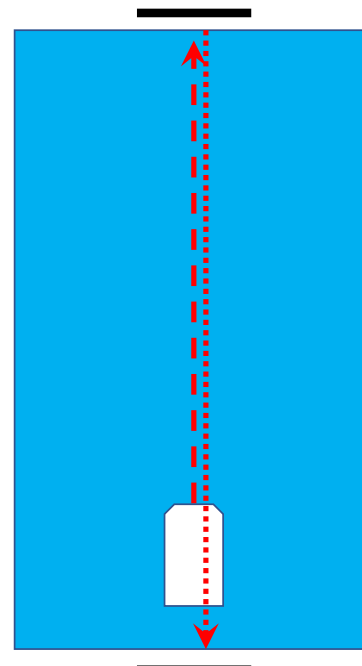
- Form a group of **4** students
- Register your group members with your lab demonstrator, who will give you a **group number**.

IMPLEMENTATION

- Design and build a model boat with any propulsion system you like (e.g. dual propeller or single propeller plus rudder). Either use your own design or use a kit.
- Use a microcontroller (Arduino Nano or similar) to interface to the boat, actuating propeller and steering.
- Note: this works best for a model boat with dedicated servo for steering and separate motor controller. However, you can also reverse-engineer combined control electronics, which is often encountered in cheaper models.

TASK

- (1) Connect your embedded controller to your model boat.
- (2) Implement “drive-by-wire” from the controller for steering and drive system
- (3) Add two sensors to the boat:
 - a. Heading sensor, e.g. magnetometer compass
 - b. Distance sensor to the front of the boat, e.g. SHARP infrared PSD
- (4) Implement a program to “drive across the pool”:
 - a. Drive as straight as possible until wall on opposite side is reached
 - b. Conduct a 180° turn
 - c. Drive back straight until the wall on the starting side is reached
 - d. Stop the motor



PRESENTATION

On the scheduled presentation day at the end of the semester, all groups will demonstrate their projects.

SUBMISSION

Submit the following as a single document via LMS incl. declarations of all team members.:

1. Project design report (*pdf*), which includes
 - Report on which person did what
 - Hardware circuit diagram with explanations
 - Software design description and diagram
2. Project budget (*Excel*) with “bill of material”
 - Part numbers and names
 - Part quantity
 - Price per part
 - Source (where purchased)
3. User Manual (*pdf*)
As if it was sold to a customer
4. Marketing and sales document (*html/web-format*)
Incl. photo and brief system description as if selling it on *eBay*

The actual project build needs to be submitted after your presentation with an attached sticker showing group number and all student names.

MARKING

60% Functional Performance
10% Project Design Report
10% User Manual
10% Budget
10% Marketing Documents

GROUP NO: _____

Name1 _____ Name2 _____

Name3 _____ Name4 _____

LAB DEMONSTRATOR **SIGN OFF** Design (wk7): _____