



**Carleton**  
UNIVERSITY

Department of  
**Systems and  
Computer Engineering**

## **SYSC 4805 Computer Systems Design Lab**

### **Calendar description**

Project-oriented experience in the design of embedded computer systems. Lectures will discuss practical aspects related to the design and development of embedded systems, starting from sensor data acquisition and processing to decision systems, testing and embedded-system based project management, with practical application examples.

Includes: Experiential Learning Activity.

Lectures two hours a week, laboratory four hours a week.

<http://calendar.carleton.ca/undergrad/courses/SYSC/>

### **Prerequisites**

SYSC 3320 or SYSC 3601, and enrolment in Computer Systems Engineering.

### **Prior knowledge**

Students should have knowledge of:

- Programming in C and basic I/O interfacing.

### **Course objectives**

This course builds on the existing knowledge about software and hardware interfacing, software modeling and software development process, systems development processes and testing, acquired during the program. It aims at enhancing the technical knowledge in the field of computer engineering by the use of various sensors, performing data fusion, and programming a microcontroller to acquire, process the data and make decisions based on it, with a practical application in mobile robots. It also aims at developing soft skills for the future engineers ready to embark in their careers by cultivating team work skills and entrepreneurial spirit. The goal is to develop a deeper understanding of the multifaceted process of managing and developing engineering projects.

### **List of topics**

- Design and development of embedded systems with microcontrollers
- Team-based project management
- Data acquisition.
- Sensors

- Sensor types
- Protocols
- I/O interfacing
- Sensor data processing and decision-making
- Data sampling & filtering
- Dealing with noise
- Robot localization and mapping
- Robot path planning and navigation
- Testing and performance. Evaluation

## Learning outcomes

By the end of this course, students should be able to:

- Define concepts of product design, development methodology and team-based (small) project management.
- Design an embedded microcontroller-based system for an engineering problem involving hardware and software components.
- Identify and adapt to realistic constraints.
- Analyze potential solutions for an engineering project.
- Use appropriate knowledge and skills to formulate, analyze and solve an engineering problem.
- Apply scientific methods to evaluate and predict performance.
- Define, plan and manage a moderately complex project.
- Develop team work and entrepreneurial skills.
- Develop communications skills through technical presentations and reports.

## Graduate Attributes (GAs)

The Canadian Engineering Accreditation Board requires graduates of engineering programs to possess 12 attributes at the time of graduation. Activities related to the learning outcomes listed above are measured throughout the course and are part of the department's continual improvement process. Graduate attribute measurements will not be taken into consideration in determining a student's grade in the course. For more information, please visit: <https://engineerscanada.ca/>.

| Graduate Attribute  | Learning outcome(s) |
|---|---------------------|
| 1.5.S: Knowledge Base: Applied: Computer systems                      | 1, 2, 3             |
| 1.8.S: Knowledge Base: Applied: Software engineering                  | 1, 2, 3             |
| 2.2: Problem Analysis: Applied: Approach to the problem               | 3, 4, 5             |
| 4.4: Design: Applied: Design solution(s)                              | 3, 4, 5, 6          |
| 4.5: Design: Applied: Design implementation / task(s) definition      | 3, 4, 5, 6          |
| 6.2: Individual and Team Work: Applied: Group culture, group dynamics | 7, 8                |
| 7.3: Communication Skills: Applied: Oral and written presentations    | 9                   |
| 7.4: Communication Skills: Applied: Technical reading                 | 9                   |

## **Accreditation Units (AUs)**

For more information about Accreditation Units, please visit:  
<https://engineerscanada.ca/>.

The course has a total of 49 AUs, divided into:

- Engineering Design: 100%

## **Instructor and TA contact**

Specific to course offering (tbd)

## **Textbook (or other resources)**

Specific to course offering (tbd)

## **Evaluation and grading scheme**

Specific to course offering (tbd)

## **Breakdown of course requirements**

Specific to course offering (tbd)

## **Tentative week-by-week breakdown**

Specific to course offering (tbd)

## **General regulations**

Specific to course offering (tbd)