

# CSC490H1 S

## Capstone Design Project

### Winter 2025 Syllabus

## Course Meetings

### CSC490H1 S

Section	Day & Time	Delivery Mode & Location
LEC0101	Tuesday, 3:00 PM - 6:00 PM	In Person: BA 2200

Refer to ACORN for the most up-to-date information about the location of the course meetings.

## Course Contacts

**Instructor:** Dr. Paul H. Dietz

**Email:** [paul.dietz@utoronto.ca](mailto:paul.dietz@utoronto.ca)

**Office Hours and Location:** Generally Thursdays and Mondays 2-4PM in SF4301, but will shift some weeks as per class announcements

**Additional Notes:** Students are encourage to use the class Discourse server

**Teaching Assistant:** Dhruv Verma

**Email:** [dhruvverma@cs.toronto.edu](mailto:dhruvverma@cs.toronto.edu)

**Office Hours and Location:** By appointment

## Course Overview

This half-course gives students experience solving a substantial problem that may span several areas of Computer Science. Students will define the scope of the problem, develop a solution plan, produce a working implementation, and present their work using written, oral, and (if suitable) video reports. Class time will focus on the project, but may include some lectures. The class will be small and highly interactive. Project themes change each year. Contact the Computer Science Undergraduate Office for information about this year's topic themes, required preparation, and course enrolment procedures. Not eligible for CR/NCR option. A refundable deposit of \$90 will be charged for the use of Arduino kit in lab activities.

Students must submit an application to the course describing relevant interests, experience, and skills and general academic history. Application questions are set and assessed by the instructor. Applications from St. George students enrolled in a Computer Science program or the Data Science Specialist program will be considered first. Applications by students from other programs with appropriate prerequisites will be considered as space permits.

Please visit <https://q.utoronto.ca/courses/221753/pages/400-level-course-balloting-and-applications> for application deadlines and details. A decision on your application will be

confirmed approximately 2-3 weeks after the application deadline, so students should enrol in an alternate course until the results of their application are confirmed.

In an increasingly virtual world, people crave physical experiences. Your goal in this capstone class is to create a computer-driven system that interacts with people in the real world through various sensors and actuators to provide a novel and highly compelling experience that serves a social good. Roughly half of the semester will be dedicated to skills building – learning about such topics as microcontrollers and hardware interfaces, rapid prototyping with 3D printing, and creating your own custom circuit boards. The second half will be devoted to your final project. The more whimsical and imaginative, the better! Keep in mind that you will also need a story about how your project can make the world a slightly better place.

You may work on your project independently or in small groups. Once you have a project in mind, you (with our help) will need to find a community sponsor – someone who believes in the goal of your project and who serves as your “customer”. All sponsors will be invited to the public demo event. You will also need to thoroughly document your project with a publicly accessible website.

Possible projects might include:

- Sonify a playground – add sensors to swings, teetertotters and other playground equipment to produce calming, fun and magical sounds. Encourage kids to play together to unlock new sound experiences.
- Interactive public infrastructure – create new ways for the public to interact with public infrastructure – for example, create gesture and other interfaces for the fountains in Nathan Phillips Square
- Encourage strangers to meet while waiting on line with a touch sensitive, light up, handrail system that invites collaborative game play
- Zoo Keys 2.0 – Zoo Keys were animal-shaped keys that kids would use in Zoos to unlock fun audio descriptions of the animals. In your modern version, the keys are personalized, allowing the stations to present information in your language, for your age and interests. It can even power scavenger hunts and other zoo games.

## **Course Learning Outcomes**

The goal of this capstone class is to demonstrate your broad understanding of computer science by creating a novel and compelling interactive project employing physical computing. You will learn prototyping skills involving microcontrollers, 3D printing, and Printed Circuit Board design which can be applied in your project. But most importantly, you will develop a sense of what makes a project compelling to others through repeated practice.

**Prerequisites:** 1.5 credits of 300+ level CSC courses.

**Corequisites:** None

**Exclusions:** NOTE: Students not enrolled in the Computer Science Major or Specialist program at A&S, UTM, or UTSC, or the Data Science Specialist at A&S, are limited to a maximum of 1.5 credits in 300-/400-level CSC/ECE courses.

**Recommended Preparation:** None

Credit Value: 0.5

## Marking Scheme

Assessment	Percent	Details	Due Date
Arduino Project	10%		2025-01-14
Peripherals Project	10%		2025-01-21
PCB Project	10%		2025-01-28
3D Printing Project	10%		2025-02-04
Final Project	60%		2025-04-25

## Late Assessment Submissions Policy

Work late will be accepted in exceptional cases such as illness, etc. Unacceptable work may be returned for refinement, in which case an additional week will be provided.

## Course Schedule

Week	Description
<b>Week 1</b> Date	Introduction to Arduino
<b>Week 2</b> Date	Arduino Under the Hood
<b>Week 3</b> Date	Printed Circuit Board Design
<b>Week 4</b> Date	3D Printing
<b>Week 5</b> Date	Project Brainstorming
<b>Week 6</b> Date	Remain weeks are for final project
<b>Week 7</b> Date	

<b>Week 8</b> Date	
<b>Week 9</b> Date	
<b>Week 10</b> Date	
<b>Week 11</b> Date	
<b>Week 12</b> Date	

## Policies & Statements

### Religious Accommodations

As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of cultural and religious traditions. For my part, I will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. Further to University Policy, if you anticipate being absent from class or missing a major course activity (such as a test or in-class assignment) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

### Students with Disabilities or Accommodation Requirements

Students with diverse learning styles and needs are welcome in this course. If you have an acute or ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) at the beginning of the academic year by visiting <https://studentlife.utoronto.ca/departments/accessibility-services/>. Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will assess your situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your needs or condition with any instructor, and your instructors will not reveal that you are registered with AS.

### Academic Integrity

All suspected cases of academic dishonesty will be investigated following procedures outlined in the [Code of Behaviour on Academic Matters](https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019) (<https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019>). If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, please reach out to me. Note that you are expected to seek out additional information on academic integrity from me or from other institutional resources. For example, to learn more about how to cite and use source material appropriately and for other writing support, see the U of T writing support website at <http://www.writing.utoronto.ca>. Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations. For more information, please see [A&S Student Academic Integrity](https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity) (<https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity>) and the [University of Toronto Website on Academic Integrity](https://www.academicintegrity.utoronto.ca) (<https://www.academicintegrity.utoronto.ca>).

### **Specific Medical Circumstances**

If you become ill and it affects your ability to do your academic work, consult me right away. Normally, I will ask you for documentation in support of your specific medical circumstances. This documentation can be an Absence Declaration (via ACORN) or the University's Verification of Student Illness or Injury (VOI) form. The VOI indicates the impact and severity of the illness, while protecting your privacy about the details of the nature of the illness. If you cannot submit a VOI due to limits on terms of use, you can submit a different form (like a letter from a doctor), as long as it is an original document, and it contains the same information as the VOI (including dates, academic impact, practitioner's signature, phone and registration number). For more information on the VOI, please see <http://www.illnessverification.utoronto.ca>. For information on Absence Declaration Tool for A&S students, please see <https://www.artsci.utoronto.ca/absence>. If you get a concussion, break your hand, or suffer some other acute injury, you should register with Accessibility Services as soon as possible.

### **Accommodation for Personal Reasons**

There may be times when you are unable to complete course work on time due to non-medical reasons. If you have concerns, speak to me or to an advisor in your College Registrar's office; they can help you to decide if you want to request an extension or other forms of academic consideration. They may be able to email your instructors directly to provide a College Registrar's letter of support and connect you with other helpful resources on campus.

### **Quercus Info (if using)**

This Course uses the University's learning management system, Quercus, to post information about the course. This includes posting readings and other materials required to complete class activities and course assignments, as well as sharing important announcements and updates. New information and resources will be posted regularly as we move through the term. To access the course website, go to the U of T Quercus log-in page at <https://q.utoronto.ca>. SPECIAL NOTE ABOUT GRADES POSTED ONLINE: Please also note that any grades posted are for your information only, so you can view and track your progress through the course. No grades are considered official, including any posted in Quercus at any point in the term, until

they have been formally approved and posted on ACORN at the end of the course. Please contact me as soon as possible if you think there is an error in any grade posted on Quercus.

### **Attendance**

During the first half of the course, we will have student presentations at the beginning of each class. Please arrive promptly. Presentations will begin at 10 minutes past the hour, and you are expected to participate as a supportive, respectful, and enthusiastic audience. Regularly arriving more than 10 minutes past the hour may negatively impact your grade.

### **Online Communication**

Class announcements and discussions will occur on the class Discord server. You are expected to check this regularly. In addition, you can contact the Instructor and TA via their respective email addresses.