# ENGG*1410: Introductory Programming for Engineers
## Fall 2021

## UNIVERSITY of GUELPH
### School of Engineering

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## INSTRUCTIONAL SUPPORT

### Course Instructor

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|---|---|
| Instructor: | Shawki Areibi, Ph.D., P.Eng. |
| Office: | THRN 2335, ext. x53819 |
| Email: | sareibi@uoguelph.ca |
| Personal Web Page: | https://sareibi.uoguelph.ca/ |
| Course Web Page: | http://islab.soe.uoguelph.ca/sareibi/TEACHING_dr/ENG141_html_dr/eng141.html |
| Office hours: | Tuesday: 2:00 PM - 3:00 PM |

### Lab Instructor/Coordinator

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|---|---|
| Instructor: | Matthew Saunders |
| Office: | RICH 1506, ext. 53916 |
| Email: | msaund05@uoguelph.ca |

### Teaching Assistants

| GTA | Office | Email | Office Hours |
|---|---|---|---|
| TA#1: ...... .......... | Thorn .... | ........@uoguelph.ca | Monday 10:30 AM - 11:30 AM |
| TA#2: ...... .......... | Thorn .... | ........@uoguelph.ca | Tuesday 10:30 AM - 11:30 AM |
| TA#3: ...... .......... | Thorn .... | ........@uoguelph.ca | Thursday 10:30 AM - 11:30 AM |

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## LEARNING RESOURCES

### Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG*1410 Courselink and webpage Course Web-page site. You are responsible for checking the site regularly.

### Required Resources

1. S. Kochan *Programming in C, Fourth Edition* Pearson, 2015

## Recommended Resources

1. G. Perry and D. Miller, *C Programming: Absolute Beginner's Guide*, 3rd Edition, Pearson Education, 2014.

2. Lecture Notes.

## Additional Resources

1. Lecture Information: All the lecture notes are posted on the web page (week #1-#12).

2. Lab Information: The handouts for all the lab sessions are within the lab section. All types of resources regarding tutorials, links to web pages can be found in this section.

3. Assignments: Download the assignments according to the schedule given in this handout. All the solutions will be posted as indicated.

4. Exams: Some midterms and finals of previous years are posted as samples of exams. The solutions are also posted for your convenience.

5. Miscellaneous Information: Other information related to Digital Design are also posted on the web page.

## Communication & Email Policy

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly**. As per university regulations, all students are required to check their "mail.uoguelph.ca" e-mail account regularly: e-mail is the official route of communication between the University and its student.

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# ASSESSMENT

## Dates and Distribution

1. Assignments: 20%
   See Section 5 for due dates

2. Labs and Mini Projects: 25%
   Weekly Labs

3. Midterm: 15%
   Week 6, (Date, Time, Location: TBA).

4. Final Exam: 40%
   December .... 2021, .... AM (Date, Time, Location: TBA).

## Course Grading Policies

**Missed Assessments:** If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

**Accommodation of Religious Obligations:** If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Consideration of Religious Obligations:

http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

**Passing grade:** In order to pass the course, you must pass both the laboratory and exam course portions. Students must obtain a grade of 50% or higher on the exam portion of the course in order for the laboratory write-up portion of the course to count towards the final grade.

**Missed midterm/quiz tests:** If you miss a test due to grounds for granting academic consideration or religious accommodation, the weight of any missed test will be added to the final exam weight. There will be **no makeup midterm/quizzes tests**.

**Lab Work:** You must attend and complete all laboratories. If you miss a laboratory due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the teaching assistant to complete a makeup lab.

**Late Lab Reports:** Late submissions of lab reports will be penalized unless you have good reasons. Explain to your teaching assistant the circumstances of why your lab report is submitted late.

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# AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

## Calendar Description

*This course is for students requiring an introduction and understanding of programming. The goal of this course is to introduce students to the basics of computer software and understand how to use it for problem solving. Topics include the structure of computers, developing and debugging software, data representation and manipulation, functions and program modularization, complex data types, pointers, strings, recursion, file I/O, and simple data structures. Students planning to take additional CIS courses require this course. Previous programming experience is recommended. Students lacking programming experience should consult with their program counsellor.*
*Prerequisite(s): None.*

## Course Aims

This course is an introductory course to Programming, which is a basic course in most Electrical and Computer Engineering programs. The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

## Learning Objectives

1. To learn the funamental programming concepts and methodologies which are essential to building effective C program.

2. To practice the fundamental programming methodologies in the C programming language via assignments and lab experience.

3. To code, document, test and implement a well-structured, robust computer program using the C programming language.

4. To write reusable modules in the form of functions.

## Learning Outcomes

The main goals of the course are (a) to teach students the fundamental concepts of programming (b) to illustrate clearly how programming can be used to solve engineering problems, (c) demonstrate the relationship between hardware and software in computer systems.

At the successful completion of this course, the student will have demonstrated the ability to:

1. Design and implement a solution for a given problem.

2. Write a structured program in C to solve many Engineering problems.

3. Manage storage by statically and dynamically allocating and freeing space for arrays, strings, structs etc.

4. Debug and correct the syntax of a written program in C.

5. Use most aspects and constructs in C including flow control, structures and File I/O.

6. Understand the scope of variables and functions and their usage of the stack.

## Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate Attributes:

| Graduate Attribute | Learning Objectives | Assessment |
|---|---|---|
| 1. Knowledge Base for Engineering | 1, 2, 4, 5 | Exams, Assignment |
| 2. Problem Analysis | 2, 3 | Exams, Assignment |
| 3. Investigation | | - |
| 4. Design | 2, 3, 4, 5 | Labs, Exams, Assignment |
| 5. Use of Engineering Tools | 2, 3, 4, 5, 6 | Labs |
| 6. Individual& Team Work | 3 | - |
| 7. Communication Skills | 1 | Labs |
| 8. Professionalism | | - |
| 9. Impact on Society and Environment | | - |
| 10. Ethics and Equity | | - |
| 11. Environment, Society, & Project Management | | - |
| 12. Life-Long Learning | | - |

## Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Course-link/D2L but these are not intended to be stand-alone course notes. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and project.

## Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and tutorials. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular

activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

### Relationships with other Courses

ENGG*1410 and its lab will teach you plenty about software programming, its specification, design and implementation. More importantly however, is that it prepares you for other software courses you will cover in upper years. The course has no prerequisites.

Several other courses in the curriculum expand on ENGG*1410:

- **ENG*1510, Object Oriented Programming:** This course will introduce students to the concept of Object Programming.

- **CIS*2520, Data Structures:** This course is a study of basic data structures, such as lists, stacks, queues, trees, and tables. Topics which will be examined include abstract data types, sequential and linked prepresentations, and an introduction to algorithm analysis, various traversal, search, insertion, removal, and sorting algorithms.

- **CIS*3110, Operating Systems:** This course covers operating systems in theory and practice by focusing on the components in a system: scheduling, resource allocation, process management, multi-programming, multi-taksing, I/I control, file systems, and mechanisms for client-server computing using examples from contemporary operating systems.

## TEACHING AND LEARNING ACTIVITIES

### Timetable

| **Lectures:** | | | | |
|---|---|---|---|---|
| Monday | All Sections | 11:30 AM - 12:50 PM | Room Virtual | S. Areibi |
| Wednesday | All Sections | 11:30 AM - 12:50 PM | Room Virtual | S. Areibi |
| Friday | All Sections | 11:30 AM - 12:50 PM | Room Virtual | S. Areibi |
| **Seminars (Tutorials):** | | | | |
| Tuesday | Sec ...... | 16:30 PM - 17:20 PM | Room Virtual | TA#1 |
| Wednesday | Sec ...... | 13:30 PM - 14:20 PM | Room Virtual | TA#1 |
| Thursday | Sec ...... | 16:30 PM - 17:20 PM | Room Virtual | TA#1 |
| **Laboratory:** | | | | |
| Wednesday | Sec ...... | 15:30 PM - 17:20 PM | Rich 1532 | TA#1/M. Saunders |
| Thursday | Sec ...... | 08:30 AM - 10:20 AM | Rich 1532 | TA#2/M. Saunders |
| Friday | Sec ...... | 14:30 PM - 16:20 PM | Room Virtual | TA#3/M. Saunders |

## Lecture Schedule

| Lectures | Lecture Topics | References | Learning Objectives |
|---|---|---|---|
| 1-3 | Introduction to Programming | Chapter 1 | 1 |
| 4-7 | Variables, Data Types & Arithmetic | Chapter 2 | 1,2,3 |
| 8-10 | Input/Output Operations in C | Chapter 7 | 2,3,4,5 |
| 11-13 | Program Looping and Decision Making | Chapter 3 | 1,2,3,4 |
| 14-18 | Functions in C | Chapter 4 | 2,3,4,5,6 |
| 19-22 | Arrays and Strings | Chapter 5 | 2,3,5,6 |
| 23-24 | Pointers in C | Chapter 5 | 3,4,5,6 |
| 25-26 | User Defined Data Types (Struct ...) | Chapter 6 | 2,3,4,5,6 |
| 27-28 | Files in C | Chapter 6 | 2,3,4,5,6 |
| 29-30 | Operations on Bits | Chapter 6 | 2,3,4,5,6 |
| 31-32 | Makefiles and Debugging Programs | Chapter 8 | 4,5 |
| 33-34 | Abstract Data Types | Chapter 9 | 5 |
| 35-36 | Intro. to Object Oriented Programming | Chapter 10 | 6 |

## Assignments

There will be 12 assignments throughout the term. **Solve all problems** and hand in your assignment to the teaching assistant in the tutorial or in the drop box.

| Item | Handed In | Due Date | Topic |
|---|---|---|---|
| Assign #1 | (Week #1) | Week #2 | Simple C Programs |
| Assign #2 | (Week #2) | Week #3 | Variables, Data Types |
| Assign #3 | (Week #3) | Week #4 | Input & Ouput in C |
| Assign #4 | (Week #4) | Week #5 | Loops and Decisions in C |
| Assign #5 | (Week #5) | Week #6 | Arrays in C |
| Assign #6 | (Week #6) | Week #7 | Function in C |
| Assign #7 | (Week #7) | Week #8 | Strings in C |
| Assign #8 | (Week #8) | Week #9 | Structures in C |
| Assign #9 | (Week #9) | Week #10 | Pointers in C |
| Assign #10 | (Week #10) | Week #11 | File I/O |
| Assign #11 | (Week #11) | Week #12 | Operations on Bits |
| Assign #12 | (Week #12) | Week #13 | Abstract Data Types |

## Lab Schedule

There will be 7 labs throughout the term. Below are the due dates:

| Week | Topic | Report | Due Date |
| --- | --- | --- | --- |
| 1 | Lab#0: Intro to Lab, Compiler and Text Editors | None | - |
| 2 | Lab#1: Compiling and Executing Programs | Yes | Week 3 (Drop Box) |
| 3 | Lab#2: Debugging Programs (Syntax/Semantic Errors) | Yes | Week 4 (Drop Box) |
| 4 | Lab#3: Make Files (Compiling several files) | Yes | Week 5 (Drop Box) |
| 5 | Lab#4: Version Control (Github) | Yes | Week 6 (Drop Box) |
| 6 | Lab#5: **Mini Project #1** | Yes | Week 8 (Drop Box) |
| 7 | Lab#5: **Mini Project #1 .. Continue** | - | |
| 8 | Lab#6: **Mini Project #2** | Yes | Week 10 (Drop Box) |
| 9 | Lab#6: **Mini Project #2 .. Continue** | - | - |
| 10 | Lab#7: **Mini Project #3** | Yes | Week 12 (Drop Box) |
| 11 | Lab#7: **Mini Project #3 .. Continue** | - | |
| 12 | No Labs Scheduled on Week #12 | - | - |

## Other Important Dates

1. Thursday, 9th September 2021: **Classes Start**.

2. Monday, 11th October 2021: **Thanks Giving Holiday, No Classes Scheduled**.

3. Tuesday, 12th October 2021: **Fall Study Break, No Classes Scheduled**.

4. Thursday, 2nd December 2021: **Lecture** (Tuesday Oct 12th Schedule in Effect).

5. Friday, 3rd December 2021: **Last Class** (Monday Oct 11th Schedule in Effect).

# LAB SAFETY

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

# ACADEMIC MISCONDUCT

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offenses from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offense should consult with a faculty member.

### **Resources**

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:
http://www.academicintegrity.uoguelph.ca/

Please also review the section on Academic Misconduct in your Engineering Program Guide.

The School of Engineering has adopted a Code of Ethics that can be found at:
http://www.uoguelph.ca/engineering/undergrad-counselling-ethics

# ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Centre for Students with Disabilities as soon as possible

# RECORDING OF MATERIALS

Presentations which are made in relation to course work-including lectures-cannot be recorded or copied without the permission of the presenter, whether the instructor, classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

# RESOURCES

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:
http://www.uoguelph.ca/registrar/calendars/index.cfm?index