

CS 136 - Elementary Algorithm Design and Data Abstraction

Spring 2020 Course Outline

Course website: <https://www.student.cs.uwaterloo.ca/~cs136/>

Request System: <https://www.student.cs.uwaterloo.ca/~cs136/cgi-bin/requests>

Course newsgroup: Piazza – See course webpage

Please note that any term-specific content of this document is decided tentatively at the beginning of the term and is subject to change. See the course website for current, up-to-date information.

Course Objectives and Description

CS 136 examines elementary data structures and algorithms using imperative as well as functional paradigms of computation, and discusses issues surrounding the effective use of programming languages in “real-world” environments.

Course Outline

Introduction to C (7.5 hours)

Variable declaration and value assignment. Infix expressions, operator precedence, and sequencing of statements. Control flow through looping and conditionals. Basic I/O. Integers, floating-point numbers, and C-strings. Modelling recursion using an imperative programming paradigm. The limits of recursion in C.

The Memory Model of C and Memory Management (6 hours)

Values *versus* references. Box-and-pointer diagrams. Dereferencing and multiple indirection. Pointers, addresses, garbage collection, and memory reuse. Stack *versus* heap memory. Memory allocation and deallocation. Safety and usability issues.

Mutation, Interaction, and Encapsulation (7.5 hours)

Mutation of identifier–value bindings in C. Variable, pointer, structure, and array mutation in C. Side effects. State encapsulation through opaque structures.

Abstraction and Abstract Data Types (6 hours)

Modules and libraries. Information hiding in C. Definition and implementation of ADTs. Separate compilation in C. Overview of approaches to abstraction and code reuse in other languages (Java, C++, ML, Haskell).

Efficiency (7.5 hours)

O-notation. Analysis of simple programs and standard algorithms in C. Logarithmic-time array operations. Linear and binary search. Hash tables and their uses.

History of Computer Science (1.5 hour)

History of concepts covered in this course.

Textbooks

We will also be using [*C Programming: A Modern Approach*](#), by K.N. King. (Recommended / Optional Textbook)

We will be using the CS 135 textbook ([How to Design Programs](#)) (Optional Textbook) in CS 136, which is available online.

Grading Scheme

Final marks for Spring 2020 will be computed as follows:

- Assignments: 90%
- Assignment 0: 0%, required
- Assignment 1 – 4: 5%
- Assignment 5 – 8: 10%
- Assignment 9 & 10: 15%
- Online Quizzes: 10%

Minimum Requirements

To pass the course, students must have a weighted average of 50% or better on the graded assignments. There are 11 planned assignments and all the assignments are weighted differently. Completing assignments is crucial for mastering course material.

One of the courses following CS 136 in the Computer Science curriculum is CS246. It currently has a prerequisite of 60% or more in CS 136. If you earn 60% or more in CS 136 you may go on to CS246. Otherwise,

- if your CS 136 mark is less than 50% you must repeat CS 136 before going on. A failure will be recorded on your academic record.
- if your CS 136 mark is in the 50's you must repeat CS 136 before going on to take CS246. You may take CS245 (recommended) or CS251 while you repeat CS 136. A failure will not be recorded on your record, but the mark will be included in your averages and retaking the course will count as a course attempt.

Marks Look-up

For your convenience, we provide a facility to [check your unofficial marks online](#).

As your assignment and exam marks are recorded, they will be made available on this website. You will need your WatIAM username (8 characters or less) and password in order to log in. Errors in the marks should be reported to an ISA.

Handmarking Results on MarkUs

We will be using [MarkUs](#) for handmarking assignments in CS 136 this term.

To log in to MarkUs, enter your WatIAM username and password. Once you log in, you should see a summary page of all the assignments that have been handmarked so far.

The results for certain assignments may say "nan", if the handmarked portion was not allotted any marks. However, TAs look over all submissions and make helpful suggestions for improving solutions. If you did not get perfect on Marmoset, you can use these annotations as a starting point for revisiting your solution.

To view the annotations in MarkUs, click on the assignment name and then click on the Results tab near the top of the page. Here you will see your Marmoset submission with highlighted sections. Mousing over these sections will show you the TAs annotation.

Remark Requests

Remark request will only be accepted up to **two weeks** from the release of the assignment mark.

Please carefully read through the comments made by the marker on MarkUs before sending a remark request.

If you believe the hand-marked portion (style and efficiency) was marked incorrectly, you may submit a remark request using the Request System. We will **not** accept remark requests for the Marmoset tests unless the test itself was written incorrectly (i.e. we will not be able to process requests that ask for an extension / accept late submissions / award partial marks for some tests you failed on Marmoset).

Calendar

Below is the information about the **tentative schedule** of assignments and quizzes. Assignments must be handed in **by 9:00 pm EDT** on the day they are due. All dates are subject to change.

Week of May 11th

- **Reading:** End of Section 1
- **Due:** Quiz 1, Sunday May 17th at 11:59 pm
- No assignment due

Week of May 18th

- **Reading:** End of Section 2
- **Due:** Assignment 0, Friday, May 22nd, at 9:00 pm
- **Due:** Quiz 2, Sunday May 24th at 11:59 pm

Week of May 25th

- **Reading:** End of Section 3
- **Due:** Assignment 1, Friday, May 29th, at 9:00 pm
- **Due:** Quiz 3, Sunday May 31st, at 11:59 pm

Week of June 1st

- **Reading:** Section 4 – slide 52
- **Due:** Assignment 2, Friday, June 5th, at 9:00 pm.
- **Due:** Quiz 4, Sunday June 7th at 11:59 pm

Week of June 8th

- **Reading:** Section 5 – slide 22
- **Due:** Assignment 3, Friday, June 12th, at 9:00 pm.
- **Due:** Quiz 5, Sunday June 14th at 11:59 pm

Week of June 15th

- **Reading:** Section 6 – slide 34
- **Due:** Assignment 4, Friday, June 19th, at 9:00 pm.
- **Due:** Quiz 6, Sunday June 21st at 11:59 pm

Week of June 22nd

- **Reading:** Section 7 – slide 31
- **Due:** Assignment 5, Friday, June 26th, at 9:00 pm.
- **Due:** Quiz 7, Sunday June 28th at 11:59 pm

Week of June 29th

- **Reading:** Section 8 – slide 16
- **Due:** Assignment 6, Friday, July 3rd, at 9:00 pm.
- **Due:** Quiz 8, Sunday July 5th at 11:59 pm

Week of July 6th

- **Reading:** Section 9 – slide 24
- **Due:** Assignment 7, Friday, July 10th, at 9:00 pm.
- **Due:** Quiz 9, Sunday July 12th at 11:59 pm

Week of July 13th

- **Reading:** Section 10 – slide 15
- **Due:** Assignment 8, Friday, July 17th, at 9:00 pm.
- **Due:** Quiz 10, Sunday July 19th at 11:59 pm

Week of July 20th

- **Reading:** Section 11 – slide 30
- **Due:** Assignment 9, Friday, July 24th, at 9:00 pm.
- **Due:** Quiz 11, Sunday July 26th at 11:59 pm

Week of July 27th

- **Reading:** Section 12 – slide 17
- **Due:** Assignment 10, Friday, July 31st, at 9:00 pm.
- **Due:** Quiz 12, Sunday August 2nd at 11:59 pm

Week of August 3rd

- **Reading:** End of Section 13
- **Due:** Quiz 13, Wednesday August 5th at 11:59 pm
- No assignment due
- **No final exam**

Personnel

Instructors

Adrian Reetz

Email: areetz@uwaterloo.ca

Office: Microsoft Teams

Office Hours: Tuesdays 9:00 am – 10:30 am and Thursdays 3:00 pm – 4:30 pm

Q&A Sessions: Tuesdays and Thursdays 11:00 am – 12:30 pm

John Akinyemi

E-mail: jakinyem@uwaterloo.ca

Office: Microsoft Teams

Office Hours: Fridays 12:30 pm – 2:00 pm

Q&A Sessions: Tuesdays and Thursdays 4:00 pm – 5:30 pm

Instructional Apprentices (IAs)

Alexander Van De Kleut

Email: avandekl@uwaterloo.ca

Office: Microsoft Teams

Connor Tannahill

Email: ctannahi@uwaterloo.ca

Office: Microsoft Teams

Instructional Support Assistants (ISAs)

Jack Bai

Office: Microsoft Teams

Office Hours: Jack: Mondays 3:30pm-5:00pm

Jiayi Wang

Office: Microsoft Teams

Office Hours: Wednesdays 1:00pm-2:30pm

[Submit a Request](#) for questions, setting up appointments with ISAs, etc. You must send emails from your student@uwaterloo.ca email account if you are a student, otherwise we cannot verify who you are and are limited to the information that we can share with you.

Instructional Support Coordinator (ISC)

Scott King

Email: sfking@uwaterloo.ca

Meeting: Microsoft Teams

Course Work Policies

Assignment Submission

Assignments are to be submitted electronically through Marmoset, typically by 9:00pm on Friday. See course webpage for more details.

Missed or Late Work

With a valid Verification of Illness Form (VIF), the weight of the assignment or quiz you missed would be shifted to the rest of your assignments or quizzes.

If you are in the above cases, please report to the CS 136 ISC.

Assignments are a key component of this course, and you are expected to complete them all. Exceptions may be granted in the case of illness or other extenuating circumstances (if you need such an exception, ask your instructor, and be aware that you may be required to provide documentation). However, no more than 1/3 of the assignments may be excluded from the final grade, regardless of your circumstances. If your circumstances are such that that level of accommodation is insufficient, consult an academic advisor to discuss your options.

Obtaining Marked Work

Since we are using Marmoset this term, there will be no assignments to hand back. All marked work and evaluations are available through Marmoset or Markus.

Remarking Policy

Submit a remark request form, which is available on the course webpage, to your course ISA to request a remark on your assignments.

Group Work

Group work on assignments is disallowed.

MOSS (Measure of Software Similarities) is used in this course as a means of comparing students' assignments to ensure academic integrity. We will report suspicious activity, and penalties for plagiarism / cheating are severe. Please read the available information about academic integrity very carefully.

Discipline cases involving any automated marking system such as Marmoset or MarkUs include, but are not limited to, printing or returning values in order to match expected test results rather than making an actual reasonable attempt to solve the problem as required in the assignment question specification.

Use of Piazza (newsgroup)

Use Piazza for general questions about assignments. Do not discuss implementation details for assignments (such as code particulars) or **concrete** assignment solutions **publicly**. **Do not discuss anything about quizzes on Piazza.**

Use of MS Teams

The use of MS Teams is exclusive to office hours and Q&A sessions and should be limited to the specific channel and timeslot. You should not post nor discuss anything relating to the assignments with others nor information about the quizzes on MS Teams. Questions on Teams should be limited to office hours and Q&A sessions. The student MS Team is only monitored during specified office hours or Q&A sessions in the specific channel.

Quizzes

Quizzes will be posted on Learn and to be completed weekly. The quizzes comprise 10% of your final grade. Each of them are weighted equally. **Quizzes are to be completed independently without any**

outside assistance. Late submission of quizzes will not be accepted.

CS 136 Plagiarism Policy

Assignment questions will be colour-coded as either “black” or “gold” to indicate if collaboration is permitted.

For “black” questions, **moderate collaboration** is permitted. You may discuss assignment strategies openly with others (including online). You may also search the Internet for strategies and code examples. Any form of collaboration **must be stated** explicitly in your submissions.

For “gold” questions, **no collaboration** is permitted. This also implies **no collaboration on test cases**. All work is to be done individually. You are not allowed to discuss solution ideas, implementation details, or code. Only clarification on what an assignment question is asking is permitted. All work submitted **must be entirely your own**. If you find yourself stuck, contact an ISA or instructor for help, instead of getting the solution from someone else. You may also ask on Piazza in a **private message**. When trying to deal with difficulties, do not copy from the book or any Web sources, unless explicitly authorized to do so.

The penalty for plagiarism is an assigned mark of zero on the assignment question or test and a deduction of 5 marks from the final course grade, consistent with School of Computer Science and Faculty of Mathematics policy. In addition, a letter detailing the offense is sent to the Associate Dean of Undergraduate Studies, meaning that subsequent offenses will carry more severe penalties, **up to suspension or expulsion**. To avoid inadvertently incurring this penalty, do not copy work from anyone or anyplace.

Quizzes are to be completed individually without any outside assistance. You are not allowed to discuss solution ideas, implementation details, or code. Doing so is a violation of academic integrity.

Mental Health Resources

Mental Health: If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support.

On-campus Resources

- Campus Wellness <https://uwaterloo.ca/campus-wellness/>
- Counselling Services: counselling.services@uwaterloo.ca / 519-888-4567 ext. 32655 / Needles Hall North 2nd floor, (NH 2401)
- MATES: one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services: mates@uwaterloo.ca
- Health Services service: located across the creek from Student Life Centre, 519-888-4096.

Off-campus Resources

- Good2Talk (24/7): Free confidential help line for post-secondary students. Phone: 1-866-925-5454
- Here 24/7: Mental Health and Crisis Service Team. Phone: 1-844-437-3247
- OK2BME: set of support services for lesbian, gay, bisexual, transgender or questioning teens in

Waterloo. Phone: 519-884-0000 ext. 213

Diversity: It is our intent that students from all diverse backgrounds and perspectives be well served by this course, and that students' learning needs be addressed both in and out of class. We recognize the immense value of the diversity in identities, perspectives, and contributions that students bring, and the benefit it has on our educational environment. Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally or for other students or student groups. In particular:

- We will gladly honour your request to address you by an alternate / preferred name or gender pronoun. Please advise us of this preference early in the semester so we may make appropriate changes to our records.
- We will honour your religious holidays and celebrations. Please inform of us these at the start of the course.
- We will follow AccessAbility Services guidelines and protocols on how to best support students with different learning needs.

University-Mandated Statement on Policies

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. (Check [the Office of Academic Integrity](#) for more information.)

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](#). When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. (Check [the Office of Academic Integrity](#) for more information.) A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](#). For typical penalties, check [Guidelines for the Assessment of Penalties](#).

Appeals: A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](#) (other than a petition) or [Policy 71, Student Discipline](#) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to [Policy 72, Student Appeals](#).

Note for students with disabilities: [AccessAbility Services](#), located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Intellectual Property. Students should be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo. Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio / video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights.

Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).