

# CS 488/688 - Introduction to Computer Graphics - Spring 2022

School of Computer Science, University of Waterloo

**Instructor:** Spencer Van Leeuwen, Office DC 2126

**Lecture times:** Monday and Wednesday, 2:30-3:50, MC 4063

**Graphics lab:** MC 3007 (open 24 hours – access code provided by instructor)

**Office hours:** Friday (2:00-3:00 PM)

**Project extended office hours:** Friday, June 24 (2:00-4:00 PM)

**Project extended office hours:** Friday, August 1 (2:00-4:00 PM)

<b>Schedule</b>		
Week	Date	Assignments & Midterm
2	May 11	A0 due
3	May 18	A1 due
5	June 1	A2 due
<b>6</b>	<b>June 8</b>	<b>Midterm (MC 4045 – 2:30-3:50)</b>
7	June 15	A3 due
8	June 22	A4 due
9	June 29	Project proposal due
10	July 6	Project revised proposal due
<b>12</b>	<b>July 19</b>	<b>Project code due</b>
<b>12</b>	<b>July 20, 21</b>	<b>Project demos</b>
<b>13</b>	<b>July 25</b>	<b>Project written report due</b>

## Deadlines

- Assignments 0-4, project proposals and the project written report are due at **2 PM**
- **Project code** is due at **10 PM**

## Important notes

- Late submissions will **NOT** be accepted and will receive a grade of **ZERO** unless alternate arrangements are made at least 24 hours before the deadline. Extensions will only be provided under special circumstances and not for reasons related to a student's time management.
- Students should contact course staff within the first two weeks of classes to resolve any issue related to:
  - lab access
  - their account on lab machines
  - setting up the provided virtual machine on their home computer
  - other software/hardware-related issues

Assignments not submitted due to these issues will also receive **ZERO** marks.

- If a student submits assignment code that does not work, they will receive a grade of **ZERO**. Please refer to the Assignments section for details about re-marks in this situation.
- Although the revised project proposal is not marked, if it is not submitted by the due date specified above, the corresponding project will receive **ZERO** marks.

## Course Staff

- Instructor:
  - Spencer Van Leeuwen ([svanlee@uwaterloo.ca](mailto:svanlee@uwaterloo.ca))
- Teaching assistants (TAs):
  - Mustafa Ege Ciklabakkal ([mustafa.ege.ciklabakkal@uwaterloo.ca](mailto:mustafa.ege.ciklabakkal@uwaterloo.ca))
  - Logan Mosier ([logan.mosier@uwaterloo.ca](mailto:logan.mosier@uwaterloo.ca))
  - Weijie Zhou ([weijie.zhou@uwaterloo.ca](mailto:weijie.zhou@uwaterloo.ca))

**Note:** TA office hours will be announced at the end of the first week of lectures. If a student cannot attend the course staff's office hours due to time conflicts with regular lectures or tutorials from other courses, they should contact the instructor by May 20<sup>th</sup> to discuss alternatives.

## Course General Resources

- Learn
- Piazza: <https://piazza.com/uwaterloo.ca/Spring2022/cs488>
- Course website: <https://student.cs.uwaterloo.ca/~cs488/Spring2022/>

## Course Description

Software and hardware for interactive computer graphics. Implementation of 3-D transformations, clipping, and projection routines. Data structures, hidden surface removal, colour shading, ray tracing and additional topics if time permits.

## Course Objectives

At the end of the course, students should be able:

- to write interactive 3D computer graphics programs;
- to understand how linear and perspective transformations are used in modeling and rendering in 3D computer graphics;
- to understand the processes of clipping, hidden surface removal, shading and other rendering techniques;
- to write a simple ray tracer.

## Required Reading Materials

CS 488/688 course notes are available on the course website. Suggested readings provided in the course notes are optional. For additional reading materials, please refer to the next section.

## Additional Reading Materials

- A list of selected e-books covering course contents is available through to library course reserves for CS488/688, Spring 2022. To access these books, students can use either the course reserves link in Learn or the course reserves link on the library website.
- Additional resources are provided on the course website.

## General Overview of Topics

- The Graphics Environment
- Mathematical Foundations
- Transformations
- Hidden Surfaces and Shading

- Ray Tracing
- Realistic Rendering
- Splines
- Animation

## Marking Scheme

- **Programming component:**
  - Assignments (1-4): 36% (9% each)
  - Project proposal: 4%
  - Project: 20%
- **Examination component:**
  - Midterm: 10%
  - Final Exam: 30%

Students must earn an average at least a 50% in both the programming and examination components of the course to pass. Bonus marks obtained in one component are not carried over to the other component. If a student fails to obtain a passing grade on either component, his/her final grade will be the grade obtained in that failed component. The instructor reserves the right, where appropriate, to adjust raw marks downward in the case of cheating and upward in other situations.

## Lectures

- The Spring 2022 offering of CS 488/688 is in-person. It is expected that students will write the midterm and final exam in person. Lectures will not be recorded. Continuity plans are outlined later in the document.
- Slides will be used to deliver most information in the course. Lecture slides will be posted on Learn but any copyright material will be excluded. The instructor may also provide technical demonstrations and elaborate on course content on the board. Therefore, there will not necessarily be a one-to-one mapping between information provided in the lectures and the materials made available online.
- In the case of missing a lecture, or parts of a lecture, the student will be responsible for obtaining the information and materials provided by the instructor during the lecture.

## Assignments

- Students are expected to work independently on the assignments and project. High-level concepts may be discussed but students are expected to write their code independently.
- Remark requests should be emailed to the TA that marked the assignment within two weeks of the date it was first returned to the students. If the issues cannot be resolved with the TA who marked the assignment, the TA will meet with the instructor who will make the final decision.
- Students are required to test their assignments on the provided virtual machine (VM) before submitting. In the README submitted with each assignment, a student should indicate that they tested their assignment on the VM. In a situation where the TA's computer does not display the assignment correctly, they will check the assignment on the VM.
- If a student received zero on an assignment because they submitted code that did not work, the student may request a remark if they can provide the TA with simple instructions to fix the code. In this case, it is expected that the student had a working assignment before submitting and they made a simple submission error (in other words, time after the deadline should not be considered an "extra debugging period"). If the

TA believes that the requested changes to the submission are reasonable, the assignment may be remarked with a **-2 deduction** from the assignment grade.

## Project

Project expectations will be covered in detail in lectures. Information about the project that is provided in lectures supersedes any conflicting information provided by the course website (of course, still feel free to ask if you are unsure).

## Communication with the course staff

- Announcements will be communicated to the students through Piazza. It is the student's responsibility to ensure that they are up to date on all announcements.
- Use public posts on Piazza for general questions about assignments that may be of interest to other students in the course. Do not discuss implementation details (such as code particulars) in public posts.
- Students should use private posts on Piazza or email the course staff for help with issues pertaining only to them. If the student believes the instructor or TA will need to share code or equations, Piazza would be preferred because of its formatting options.
- Questions requiring detailed answers should be addressed in office hours.
- In the case of any confusion regarding protocols provided for course activities, the student should contact the instructor directly to resolve it **before** the day scheduled for the given activity (e.g., exam, assignment hand-in or project demo).
- The purpose of Piazza is to help students to understand course content and assignment logistics. Piazza is not a forum for constructive feedback regarding the course delivery – if necessary, concerns may be emailed directly to the instructor. Posts or comments on Piazza of this nature, or posts or comments with a negative undertone, will be removed. The instructor may temporarily remove a student from Piazza in cases of misconduct to maintain a positive learning environment. In this case, the instructor will reach out to student to attempt to resolve the situation.

## Continuity Plans

If the instructor is unable to attend a lecture due to illness, the instructor will send a cancellation email to the class list and provide details of the alternative delivery method for lecture content.

If the university mandates that classes must transition to online-only:

- The instructor will announce updates on Piazza.
- The instructor will release lecture content on Learn.
- Students that have specific questions about the lecture materials can send an email to the instructor (using the address [srvanlee@uwaterloo.ca](mailto:srvanlee@uwaterloo.ca), with the subject "CS488/688: Lecture Question"). For questions requiring detailed answers, the instructor will indicate that student should register and attend office hours.
- Details regarding virtual office hours will be announced via Piazza.
- The graphics lab will close. It is strongly recommended that students prepare for this possibility by setting up the VM on their personal computer at the beginning of the term. Assignment deadlines will not be postponed so that students can troubleshoot the VM.
- Alternative midterm or final exam guidelines will be provided, if necessary.
- Alternative project demo guidelines will be provided, if necessary.

## University Mandatory Information

- **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 [www.uwaterloo.ca/academicintegrity/](http://www.uwaterloo.ca/academicintegrity/) 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, Stud. Petitions and Grievances, Sec. 2, [www.adm.uwaterloo.ca/infosec/Policies/policy70.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm). 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 [check [www.uwaterloo.ca/academicintegrity/](http://www.uwaterloo.ca/academicintegrity/) ] to avoid committing an academic offence, and to take responsibility for his/her actions. 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, [www.adm.uwaterloo.ca/infosec/Policies/policy71.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm). For typical penalties check Guidelines for the Assessment of Penalties, at the following web site: [www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm](http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm).
- **Appeals:** A decision made or penalty imposed under Pol. 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): [www.adm.uwaterloo.ca/infosec/Policies/policy72.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm).
- **Note for Students with Disabilities:** The AccessAbility Services Office (AAS), 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 the AAS at the beginning of each academic term.

## Additional Information

- **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);
  - 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).

- **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](mailto: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](mailto: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 extension 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.