

CS488/688 - Introduction to Computer Graphics - Spring 2021

School of Computer Science, University of Waterloo

Instructor: Gladimir V. G. Baranoski

Schedule

Week	Date	Quizzes/Assignments/ Final Assessment
2	May 20, Thursday	Assignment 0
3	May 27, Thursday	Quiz 0
4	June 3, Thursday	Assignment 1
5	June 10, Thursday	Quiz 1, Quizzes Integrity Statement
6	June 17, Thursday	Assignment 2
7	June 24, Thursday	Quiz 2
9	July 8, Thursday	Assignment 3
10	July 15, Thursday	Quiz 3
11	July 22, Thursday	Assignment 4, Release of Assignment 5 Guidelines
12	July 29, Thursday	Quiz 4
13	August 5, Thursday	Assignment 5, Release of Final Assessment Guidelines
13	August 7, Saturday	Final Assessment Integrity Statement

Important Notes:

- The deadline for the submission of assignments and integrity statements is **10 AM ET** on the days specified above as their due dates.
- Late assignment submissions (up to 24h from the specified deadline) will receive a penalty of -2 marks. Assignments submitted after 24h from the specified deadline will receive **ZERO** marks.
- Assignments whose marking require any corrective action from the course staff to address student's submission mistakes (e.g., missing files, files with incorrect names and/or permissions, problems with makefiles, etc.) will also be treated as late assignments. If the corrective action takes more than 15 minutes, then the assignment will receive **ZERO** marks. Otherwise, the assignment will receive a penalty of -2 marks.
- Students will be required to submit a signed declaration with each of their assignments. Assignments submitted without a signed declaration will receive a **ZERO** marks.
- During this term, in-person meetings with course staff will be replaced by one-on-one virtual meetings (**virtual office hours** or **VOH**). Detailed information about the registration and participation in these meetings will be provided via Piazza in the first week of classes.

1. Course Staff

- Instructor:
 - Gladimir V. G. Baranoski (gvgbaran@uwaterloo.ca). VOH to be held on Fridays at 10AM ET.
- Teaching Assistants (TAs):
 - Jumyung Chang (j48chang@uwaterloo.ca). VOH to be held on Tuesdays at 2PM ET.
 - Spencer R. Van Leeuwen (srvanlee@uwaterloo.ca). VOH to be held on Wednesdays at 2PM ET.

2. Course General Resources

- Piazza: <https://piazza.com/uwaterloo.ca/Spring2021/cs488>
- General website:
<http://www.student.cs.uwaterloo.ca/~cs488/Spring2021/index.html>
- Lessons website:
<http://pedrinho.cs.uwaterloo.ca/~gvgbaran/CS488/Spring21/CS488-S21.html>
 - The access to the lessons website is password protected.
 - The password will be released via Piazza during the first week of classes.
 - The password may be subject to change during the term. In that case, the new password will also be released via Piazza.

3. 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.

4. 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.

5. Required Reading Materials

- CS488/688 Course Notes available in the course general website and selected reading materials (handouts) to be made available in the course Lessons website. For this offering (Spring 2021), due to the current special circumstances, suggested reading materials provided within the course notes should be ignored. For additional reading materials, please refer to the next section.

6. Additional Reading Materials

- A list of selected e-books covering course contents is available through to library course reserves for CS488, Spring 2021. To access these books, students can use either the course reserves link in Learn or the course reserves link on the library website.

7. General Overview of Topics

- The Graphics Environment
- Mathematical Underpinnings
- Transformations
- Hidden Surfaces and Shading
- Ray Tracing
- Realistic Rendering
- Splines
- Animation

8. Marking Scheme

- Programming component:
 - Assignments: 50%
- Examination component:
 - Quizzes: 20%
 - Final assessment: 30%
- General notes:
 - Students must 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** is going to 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.

9. Assignments

- There will be six assignments (A0 to A5) spread throughout the term. Their specifications will be provided in the course general website.
- A0 is optional. Although it will not be considered in the computation of the course final grade, its submission is recommended so that students can resolve any issue regarding assignment submission procedures.
- A1 to A5 have the same weight.
- A5 specifications will be provided at the time of its guidelines release via Piazza on the day specified in the course schedule.

- The assignments employ several code libraries (*e.g.*, OpenGL, ImGUI, etc.) whose behaviour can vary depending on the computing environment (*e.g.*, OS, drivers, etc.). To ensure that the behaviour of the students' assignment code is the same on the machines used by the TAs to grade the assignments, students will be provided with a virtual machine image of Ubuntu on Piazza in the first week of the course. The TAs will run all assignments on the provided virtual machine using Virtual Box. It is the students' responsibility to ensure that their assignment code compiles and runs in the provided virtual machine using Virtual Box. It is also the students' responsibility to make sure that they have access to hardware (*e.g.*, a desktop PC or a laptop) capable of running the assignment code in the provided virtual machine.
- Although supporting information about software tools (*e.g.*, OpenGL and Lua) to be used in the assignments will be made available to the students in the course websites, it is also their responsibility to be able to employ these tools during the term.

10. Quizzes

- There will be five quizzes (Q0 to Q4) spread throughout the term. The quizzes will be made available via Learn on the dates specified in the course schedule. Guidelines for taking the quizzes will be provided via Piazza and they will also be available in course Lessons website.
- Q0 is optional. Although it will not be considered in the computation of the course final grade, its submission is recommended so that students can resolve any issue regarding quiz submission procedures. Q1 to Q4 have the same weight.
- The quizzes will be based on the required reading materials.
- Students must submit the quizzes integrity statement (instructions to be announced) by **June 10, 10AM ET**. Students that do not submit a valid integrity statement by the specified deadline will lose 50% of the total marks obtained in all their quizzes. Moreover, without the submission of the aforementioned quizzes integrity statement (just one for all quizzes), students will not be allowed to access the quizzes.
- Quizzes that are not submitted during their availability period will receive ZERO marks, and their availability period (including Q0) will **not** be extended.

11. Final Assessment

- The course final assessment will be made available via Learn. Final assessment (FA) guidelines will be provided via Piazza on the day specified in the course schedule, and they will also be available in course Lessons website.
- Students must submit a FA integrity statement (instructions to be announced) by **August 7, 10AM ET**. Students that do not submit a valid FA integrity statement by the specified deadline will lose 25% of the total marks obtained in their FA. Moreover, without the submission of the aforementioned FA integrity statement, students will not be allowed to access the FA.
- FAs that are not submitted during their availability period will receive ZERO marks, and the FA availability period will **not** be extended.

12. Course Delivery Approach

- For this offering (Spring 2021), we will employ a non-traditional asynchronous course-delivery approach due to special circumstances. Hence, students' self-motivation and dedication will be particularly important.

- Every week, the instructor will release in the course Lessons website required reading materials equivalent to the contents covered in two traditional lectures in previous terms. Most of these materials can be regarded as illustrated transcripts of those traditional lectures. The contents equivalent to one lecture will be released on Mondays, and the contents equivalent to another lecture will be released on Wednesdays.
- Although this course will be delivered using a text-based approach, the instructor may also recommend the viewing of short videos related to course materials during the term.
- For specific questions directly related to the required reading materials, students should register and attend the instructor's virtual office hours.
- It is the students' responsibility to read the indicated required materials before the virtual office hours with the instructor. The instructor reserves the right, where appropriate, to disregard questions whose answers can be directly found in the required reading materials or questions involving topics to be covered in subsequent Lessons whose required reading materials have not yet been indicated in the course Lessons website.

13. Course Communication Policies

- All announcements from the course staff will be provided using Piazza. **It is the students' responsibility to ensure that they are up-to-date on reading these Piazza announcements.**
- General questions about the contents of this course outline should be posted in Piazza with the subject "Course Outline" within the first two weeks of classes.
- Students should use public Piazza posts for general questions about assignments that may be of interest to other students in the course. Assignment implementation details (such as code particulars) must be addressed via private Piazza posts. A breach of this guideline will also be considered a violation of academic integrity and it will be dealt with according to the university procedures described in Policy 71, Student Discipline: www.adm.uwaterloo.ca/infosec/Policies/policy71.htm.
- The interpretation of quiz and final assessment questions is also part of their evaluation. The course staff will **not** reply to Piazza posts about quiz or final assessment questions.
- If a student has any concern about the course delivery procedures and policies, such a concern should be addressed directly with the instructor during his VOH. Piazza should not be used as a complaint forum, and general posts along those lines will be removed.
- Use the course staff's e-mail for specific issues (*e.g.*, questions about the marking of submitted work) pertaining only to you.
- **Issues requiring detailed answers should be addressed during course staff's VOH.**

14. Quiz and Assignment Policies

- Questions directly related to assignments should be directed to the TAs as instructed in the remainder of this section.
- Quizzes and assignments must be done individually and submitted using Learn. In case of any issue related to their submission procedures, the student must contact the TAs before the day scheduled for the activity (assignment or quiz) using the appropriate means indicated below.
- No messages or other information related to the quiz questions or answers should be posted in Piazza or shared using other electronic means. Any breach of these guidelines will be considered a violation of academic integrity and it will be dealt with according to the university procedures described in Policy 71, Student Discipline, www.adm.uwaterloo.ca/infosec/Policies/policy71.htm.

- Students should register and attend the instructor's VOH to address concerns with respect to the marking of quizzes within two weeks of the date it was first returned to the students.
- Students should contact the TAs about concerns with respect to the marking of assignments within two weeks of the date it was first returned to the students. If the issues cannot be resolved between the TA and the student, the TA will inform the instructor, who will make the final decision.
- In case of a special hardware or software issue preventing a student to submit an assignment or quiz by its due date, the student must contact the TAs at least 24h before that deadline.
- In case of a medical issue preventing a student to submit an assignment or quiz by its due date, the student should promptly notify the course instructor and provide the appropriate documentation.
- Students that do not have access to any of the resources required to participate in this course (*e.g.*, Piazza, Learn, VirtualBox, etc..) should contact course staff within the first two weeks of classes to address the situation. Students that enrol in the course after May 10 should contact the course staff no later than May 27.

15. 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/ 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 2, 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/] 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. For typical penalties check Guidelines for the Assessment of Penalties, at the following web site: 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.
- **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.