CS488/688 - Introduction to Computer Graphics - Spring 2020

School of Computer Science, University of Waterloo
Instructor: Gladimir V. G. Baranoski

Schedule

Week	Date	Quizzes/Assignments/ Final Assessment
2	May 21, Thursday	Assignment 0, Release of Quiz 0
3	May 28, Thursday	Quiz 0
4	June 4, Thursday	Assignment 1, Release of Quiz 1
5	June 11, Thursday	Quiz 1
6	June 18, Thursday	Assignment 2, Release of Quiz 2
7	June 25, Thursday	Quiz 2
8	July 2, Thursday	Assignment 3, Release of Quiz 3
9	July 9, Thursday	Quiz 3
10	July 16, Thursday	Assignment 4, Release of Quiz 4
11	July 23, Thursday	Quiz 4, Release of Quiz 5 and Assignment 5
12	July 30, Thursday	Quiz 5
13	August 4, Tuesday	Assignment 5, Release of Final Assessment
	August 14, Friday	Final Assessment

Important Notes:

- For this offering (Spring 2020), due to special circumstances, we will employ a non-traditional studying approach. Hence, students' self-motivation and dedication will be particularly important.

- The deadline for the submission of quizzes and assignments is **10 AM ET** on the days specified above as their due dates.

- The deadline for the submission of the final assessment is **10 PM ET** on the day specified above as its due date.

- Late quiz and assignment submissions (up to 24h from the specified deadline) will receive a penalty of -2 marks. Quizzes and 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.

1. **Course Staff**

   - Instructor:
     - Gladimir V. G. Baranoski (gvgbaran@uwaterloo.ca). Virtual office hours to be held on Fridays, with the specific times to be announced via Piazza.
   - Teaching Assistants (TAs):
     - Petri M. Varsa (pmvarsa@uwaterloo.ca). Virtual office hours to be held on Tuesdays, with the specific times to be announced via Piazza.
     - Spencer R. Van Leeuwen (srvanlee@uwaterloo.ca). Virtual office hours to be held on Wednesdays, with the specific times to be announced via Piazza.

2. **Course General Resources**

   - Piazza: `https://piazza.com/uwaterloo.ca/spring2020/cs488`
   - General website:
     `http://www.student.cs.uwaterloo.ca/~cs488/Spring2020/index.html`
   - Lessons website:
     `http://pedrinho.cs.uwaterloo.ca/~gvgbaran/CS488/SPRING20/CS488-S20.html`
     - The lessons website will be also used for releasing the quizzes and the course final assessment.
     - 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;
   - 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 2020), 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 2020. 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: 25%
     - Final assessment: 25%
   - 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 mark is going to be the mark obtained in this 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 A4 have the same weight.

- A5 is also optional. However, it may result in bonus (subjective) marks (between 0 and 4) to be added to the programming component of the students' course grades. A5 specifications will be provided at the time of its release via Piazza.

- 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 six quizzes (Q0 to Q5) spread throughout the term. They will be released through the course lessons website on the dates specified in the course schedule.

- 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 Q5 have the same weight.

- The quizzes will be based on the required reading materials.

11. **Final Assessment**

- The course final assessment will be submitted directly to the instructor via e-mail. Submission instructions will be provided at the time of its release.

12. **Course Delivery and Policies**

- We remark that, for this offering (Spring 2020), we will employ a non-traditional studying approach due to special circumstances. Hence, students' self-motivation and dedication will be particularly important.

- 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 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.

- During this term, in-person meetings with course staff will be replaced by one-on-one virtual meetings (virtual office hours). Detailed information about the registration and participation in these meetings will be provided via Piazza in the first week of classes.

- 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. The contents equivalent to one lecture will be released on Mondays, and the contents equivalent to another lecture will be released on Wednesdays. For specific questions directly related to these materials, the 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. Questions directly related to assignments should be directed to the TAs as instructed in the remainder of this section.

- The interpretation of quiz and final assessment questions is also part of their evaluation. Thus, the course staff will not reply to Piazza posts about them.

- Quiz and final assessment questions must be answered individually. No messages or other information related to these questions or answers should be posted in Piazza or shared using other electronic means until all submitted answers have been marked. 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 **Section 13**.

- Quizzes and assignments will be 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.

- 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 post. 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 **Section 13**.

- Students should contact the TAs about concerns with respect to the marking of submitted work 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.

- 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 virtual office hours.

- 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 11 should contact the course staff no later than May 29th.

13. **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 4, *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 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) *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.