



UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF COMPUTER SCIENCE
COURSE OUTLINE

1. **Course:** CPSC 453: Introduction to Computer Graphics

Lecture Sections:

L01, TR 15:30-16:45, Usman Alim, MS 636, 220-4362, ualim@ucalgary.ca

Office Hours: TR 15:00-16:00

Course Website: D2L

Computer Science Department Office, ICT 602, 220-6015, cpsc@cpsc.ucalgary.ca

2. **Prerequisites:** CPSC 319 or 331; and MATH 211 or 213; and one of MATH 253, 267, 277, 283 or AMAT 219
(<http://www.ucalgary.ca/pubs/calendar/current/computer-science.html#3620>)

3. **Grading:** The University policy on grading and related matters is described in sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

| | |
|--|-----|
| Assignments | 40% |
| Midterm | 20% |
| <i>(In-Class Tuesday March 7th, 2017)</i> | |
| Final Exam | 40% |

This course **will** have a Registrar's Scheduled Final Exam.

Special Regulations affecting Final grade: Each of the above components will be given a letter grade using the official University grading system. The final grade will be calculated using the grade point equivalents weighted by the percentages given above and then converted to a final letter grade using the official University grade point equivalents. Some of the assignments will have an extra credit portion. An A+ will be awarded to those students who otherwise (without considering the extra credit portion) qualify for an A, and have successfully completed the extra credit requirements.

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar. Section 3.6. It is the student's responsibility to familiarize themselves with these regulations. See also Section E.6 of the University calendar.
5. **Scheduled Out-of-Class Activities:** REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME ACTIVITY. If you have a clash with this out-of-class activity, please inform your instructor as soon as possible so that alternative arrangements can be made.
6. **Course Materials:**
Fundamentals of Computer Graphics Fourth Edition, Steve Marschner and Peter Shirley, AK Peters/CRC Press 2015

Online Course Components:

Lecture slides will be posted on D2L.

7. **Examination Policy:** A one-sided letter-size cheat sheet will be permitted for the midterm exam. A two-sided letter-size cheat sheet will be permitted for the final exam. A basic scientific calculator will also be allowed. Students should also read the Calendar, Section G, on examinations.
8. **Approved Mandatory and Optional Course Supplemental Fees:** None.

9. **Writing across the Curriculum Statement:** In this course, the quality of the student's writing in the weighted components of the course will be a factor in the evaluation of these components. See also Section E.2 of the University Calendar.

10. **Human Studies Statement:** Students will be expected to participate as subjects or participants in projects. See also Section E.5 of the University Calendar.

11. **OTHER IMPORTANT INFORMATION FOR STUDENTS:**

- a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offense that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K, Student Misconduct to inform yourself of definitions, processes and penalties.
- b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points which can be found in each classroom and building.
- c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf. Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Computer Science.
- d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 403-220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>
- f) **Student Union Information:** VP Academic (403) 220-3911 suvpaca@ucalgary.ca SU Faculty Rep (403) 220-3913 science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca, Student Ombuds Office: (403) 220-6420 ombuds@ucalgary.ca, <http://ucalgary.ca/provost/students/ombuds>
- g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend your cell phone should be turned off unless instructed otherwise. All communications with other individuals via laptop computers, cell phones or other devices connectable to the internet in not allowed during class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- h) **U.S.R.I.:** At the University of Calgary feedback provided by students through the Universal Student ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference – please participate in USRI surveys.

Department Approval _____ Date _____

Faculty Approval for
out of regular class-time activity: _____
Date: _____

Faculty Approval for
Alternate final examination arrangements: _____
Date: _____

A signed copy of this document is on file in the Computer Science Main Office

CPSC 453 Syllabus

Tentative Topics Covered

* Geometry and Transformations:

Euclidean, affine and projective geometry. Transformation between different coordinate systems.

* Graphics Devices and Systems:

Introduction to the modern shader-based OpenGL graphics API. Students will largely be using stock shader programs rather than writing their own.

* Colourful Images:

Trichromatic colour spaces such as RGB, XYZ, and HSV. Interpolation techniques (linear, cubic) for image resampling. Introduction to quantization and dithering.

* The Rendering Pipeline:

Core processes involved in the rendering pipeline including perspective viewing, illumination, clipping, hidden surface removal, texture mapping, and rasterization.

* Modelling Graphics Objects:

Parametric and implicit representations of curves, surfaces, and volumes. Barycentric coordinates. Modelling of piecewise polynomial parametric curves.

* Global Illumination:

Whitted ray tracing, computing ray-object intersections, introduction to radiometry.

* Image Processing:

Convolution (discrete and continuous), and convolution filters for blurring and edge detection.

Learning Outcomes:

By the end of the course, students will:

- By the end of the course, students should be able to create interactive computer programs that simulate the motion of objects within a three-dimensional scene in response to user input.
- By the end of the course, students should be able to construct geometric and mathematical representations of two- and three-dimensional shapes, and real-world objects.
- By the end of the course, students should be able to write mathematical equations that describe and control the relative sizes, positions, and orientations of objects in a virtual three-dimensional scene.
- By the end of the course, students should be able to describe how digital images are formed and represented within a computer system.
- By the end of the course, students should be able to create data structures to store properties of virtual objects in computer memory, and to design algorithms that efficiently traverse these data structures.
- By the end of the course, students should be able to create computer programs that synthesize digital images by simulating the projection of light through an image capture system (e.g. eye, lens, camera).
- By the end of the course, students should be able to recognize applications of computer graphics techniques appearing in film, print, interactive computer systems, and other forms of media.
- By the end of the course, students should be able to explain how light interacts with different types of surfaces and materials to create distinctive appearances.
- By the end of the course, students should be able to explain how light, colour, and visual imagery is perceived through the human visual system.

Allowable Sources:

No Restrictions on source material.

Cited Sources:

If you used an article, book, function or algorithm that you did not create for this course you must cite it. (This means you may have to cite yourself!) Use APA for citations in a report, paper or in the header documentation of computer code you submit. If citing a website, make sure you include the date you accessed the website. Don't forget to cite code that you used, even if you modified the code.

Level of Collaboration between Students:

You may discuss the assignments with other students in the class but all code that you write must be your own work. Do NOT share any code, do not ask others to provide you with code and do not show code that you have created for assignments to other students.

Please also see the collaboration disclosure policy below.

Disclosure Policy

If you discuss the assignments with others, make sure to cite these discussions.