



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

1. **Course:** CPSC 587: Fundamentals of Computer Animation

**Lecture Sections:**

L01, TR 14:00-15:15, Dr. Prusinkiewicz, MS 622, 220-5494, [pwp@ucalgary.ca](mailto:pwp@ucalgary.ca)

Office Hours: TR 15:30-16:30

**Course Website:** <http://algorithmicbotany.org/courses/CPSC587/Winter2017/>

(Password will be announced in Class)

**Computer Science Department Office, ICT 602, 220-6015, [cpsc@cpsc.ucalgary.ca](mailto:cpsc@cpsc.ucalgary.ca)**

2. **Prerequisites:** CPSC 453

(<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 (4)	50%
Midterm Examination	20%
<i>(In-Class Thursday February 16<sup>th</sup>, 2017)</i>	
Final Examination	30%

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

Special Regulations affecting Final grade: Each of the above components will be given a numerical grade. A corresponding letter grade will be determined using the attached table. The final numerical grade will be calculated using the numerical grades of individual components weighted by the percentages given in the above table and the converted to a final letter grade using the attached table.

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:**

None. References for suitable technical/research papers will be provided by the instructor.

**Online Course Components:**

None.

7. **Examination Policy:** Students will be allowed to bring one letter-sized page of notes to both the midterm and final exams. 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](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](mailto:suvpaca@ucalgary.ca) SU Faculty Rep (403) 220-3913 [science1@su.ucalgary.ca](mailto:science1@su.ucalgary.ca), [science2@su.ucalgary.ca](mailto:science2@su.ucalgary.ca) and [science3@su.ucalgary.ca](mailto:science3@su.ucalgary.ca), Student Ombuds Office: (403) 220-6420 [ombuds@ucalgary.ca](mailto: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](http://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 587 Percentage to Letter Grade Conversion Table**

Letter Grade	Numerical grade $x$ [%]
A	$92 \leq x$
A-	$88 \leq x < 92$
B+	$84 \leq x < 88$
B	$80 \leq x < 84$
B-	$75 \leq x < 80$
C+	$70 \leq x < 75$
C	$65 \leq x < 70$
C-	$60 \leq x < 65$
D+	$55 \leq x < 60$
D	$50 \leq x < 55$
F	$x < 50$

## **CPSC 587 Syllabus**

### **Course Description:**

Principles of traditional animation, key framing, parametric and track animation, free form deformation, inverse kinematics, dynamics, spring mass systems, particle systems, numerical integration, Lagrangian constraints, space time constraints, collisions, human animation, behavioural animation, metamorphosis, implicit animation techniques, animating liquids, gases and cloth, motion capture.

### **Topics Covered (Tentative):**

History of traditional and computer animation  
Animation production  
Keyframing and interpolation-based techniques  
Particle kinematics  
Reference frames  
Rotations in three dimensions – application of quaternions  
Kinematic animation of articulated structures  
Animation of walking  
Motion capture and retargetting  
Introduction to physically-based animation  
Single-particle dynamics, harmonic oscillator, and numerical methods for ODEs  
Mass-spring systems and the animation of cloth  
Collisions  
Position-based dynamics  
Smoothed particle hydrodynamics  
Behavioral animation and animation of crowds  
Video compression and editing

### **Learning Outcomes:**

By the end of the course: students will:

- selected methods of behavioral and crowd animation.
- create a short animation using an industry-class software (e.g. Maya or Blender);
- key mathematical concepts related to the animation of articulated objects, including forward and backward kinematics, and animation of walking including synthetic and motion capture techniques;
- ) the fundamental mathematical and physical concepts related to physically-based animation, including Newton's equations of motion of single particles, mass-spring-systems, elastic and non-elastic collisions, position-based dynamics, and smoothed-particle hydrodynamics;
- Furthermore they should understand and be able to describe, explain and implement in software: key mathematical concepts related to the description of motion of objects in space, including quaternions for the description of rotations, and explicit and semi-implicit methods for solving systems of differential equations;
- describe and distinguish between the key computer animation paradigms, including key-frame animation, physically-based animation, and behavioral animation.
- By the end of the course, the students should be able to: list and apply to computer animation the key concepts of classical animation

**Allowable Sources:**

List any texts, websites, etc that are allowable for use in the course

**Cited Sources:**

What and how should sources be cited.

Examples: Code, design/ideas, etc.

**Level of Collaboration between Students:**

Will students be collaborating on course components, yes or no? To what extent? Can be different for different course components.

How will collaboration with others be cited?

**Disclosure Policy**

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