



Course Description

3D Graphics & Animation (CMPUT307 Winter 2022)

CAB 2-35, MWF 2:00-2:50 p.m.

LABS: H01, M 5-7:50 pm CAB 2-69, LAPTOP only

H02, R 11-13:50 hrs, CSC 1-67, has computers

Instructor: Dr. Anup Basu

Teaching Assistants: Shupeí Zhang and Yingnan Ma



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<https://www.cs.ualberta.ca/~anup>

Instructor Information

- Prof. Anup Basu
- Office: CSC, 2-25 Lab (or ATH 4-02)
- Office hours: Virtual Office Hours on Zoom, time TBD after first class.
- TAs also have Virtual office hours TBD
- E-mail: basu@ualberta.ca (use your UofA account and prefix subject line with **CMPUT307**)



Some Rules



Cellphones should be turned off in Class/Lab
No cellphones or PDAs in exams

No recording (audio or video) without
explicit authorization by instructor.



Laptops or Tablets allowed exclusively for
taking notes. No Facebooking, emailing, etc.

Doctor's note not required to justify absence.
There is a form to fill in (statutory declaration).
Instructor would have the final say.



Deferral of term work is a privilege and not a right

CMPUT 307

3D Graphics and Animation has been commonly applied not only in Games and Entertainment, but also in Simulation, Education, Medicine, Earth and Atmospheric Science, Advertising, Social Media and so on.

C307 is designed to introduce the basic concepts behind 3D Graphics & Animation, with Theoretical background and simple programming exercises.

CMPUT 307 Objectives

Learn about the basics of 3D Modeling and Animation.

Understand some underlying theory behind this discipline.

Have some exposure to related programming.

Prerequisites

- Preferably 3rd year or higher-level undergrad.
- Adequate Math & Image Processing background to understand 3D modeling and animation concepts.
- CMPUT 206 or equivalent is required. This prerequisite cannot be waived for 1st & 2nd year students. 3rd & 4th year students will need permission of instructor.

CMPUT 307: Areas likely to be covered

- Huffman Coding & 3D Homogeneous Transforms
- Overview of 3D Acquisition, Modeling and Animation
- Overview of Motion Capture
- 3D Point Clouds: Point based graphics
- 3D Mesh based Modeling and Animation
- Compression, Simplification and Transmission
- 2D/3D Feature Matching and Applications
- ADVANCED TOPICS (Time Permitting):
 - Learning for 3D Shape Detection and Animation
 - Digital Universe, An Application of 3D Point Cloud Visualization in Planetariums
 - City Point Clouds, 3D Point Cloud Matching
 - 3D Medical Modeling based on CT, MRI, and Ultrasound

CMPUT 307: Some of the Detailed Topics

1. **3D Modelling**

- Mesh, Point Cloud and DICOM Data
- Surface Texture Creation
- Mesh Level-of-detail, Simplification and Refinement
- Textured Mesh Perceptual Quality and Optimized Transmission
- 3D Transformations

2. **Animation**

- Constraints
- Animation Curves, Trajectory Interpolation
- Biped and Motion Capture Data

CMPUT 307: Potential Topics

3. **Compression**

- Introduction to Data compression
- Texture/Image compression
- Mesh compression
- MoCap data compression

4. **Registration and Automation**

- Registration and Tracking of Key Points for Animation
- 3D Reconstruction using Stereo
- Embedding a skeleton into a 3D model or Generating an Animation Skeleton
- Other advanced topics

CMPUT 307: Schedule

Current Schedule (likely to change):

- Weeks 1 & 2 (Jan 5-14): Introduction, Background Review (Compression, Arithmetic Coding)
- Week 3 (Jan 17-21): 2D-3D Transforms, Homogeneous Transform, Perspective Projection
- Week 4 (Jan 24-28): Overview of 3D Modeling and Animation
- Week 5 (Jan 31-Feb 4): Motion Capture (MoCap) and applications to Animation
- Weeks 6-7 (Feb 7-18): Point based Graphics, Review for Midterm (Feb 16); Midterm (Feb 18, 50 mins. in Class) [**Note: The midterm could be moved to after reading week if there are in-person restrictions.**]
- **Week 8: Reading Week (Feb 21 – 25): No Classes**
- Week 9 (Feb 28-Mar 4): Mesh based Modeling and Animation
- Weeks 10-11 (Mar 7–18): Compression, Simplification and Transmission
- Weeks 12 (Mar 21-25): Feature Matching (2D and 3D)
- Week 13 (Mar 28-Apr 1): Learning/Digital Universe/City Point Clouds/3D Medical Modeling ...
- Week 14 (April 4-8): Advanced Topics, Review for Final Exam
- Final Exam on April 25, 9 am (Tentative, will be confirmed later)

CMPUT 307: Potential Labs

Current Plan (likely to change):

- Lab 1: Huffman Coding
- Lab 2: 2D Transforms
- Lab 3: 3D Transforms
- Lab 4: 3D Modeling and Animation
- Lab 5: MoCap Manipulation, Rigging and Skinning
- Lab 6: Principal Component Analysis (PCA)
- Lab 7: Clustering
- Lab 8: Point Cloud Processing
- Lab 9+: Mini-project with Motion Builder

CMPUT 307: Grading

- Attendance and Participation: 10%
- Labs and Quizzes: 30%
- Midterm: 20%
- Final: 40%

Course Policies

<https://www.cs.ualberta.ca/resources-services/policy-information/departments-course-policies>

- Any question or concern about marks on a particular assignment must be brought to the instructor's attention **within 3 days of its return date**. After that, the instructor will not consider remarking or re-evaluating the work.
- No deferred exams unless for exceptional cases.
- Students who miss a class/lab should take the initiatives to catch up with the course material.

CMPUT 307

Academic integrity – Plagiarism & Cheating

- ... share responsibility and don't take advantage of others efforts

- ... acknowledge others contributions

You can discuss Lab work with others. However, you must prepare and submit by yourself & not copy work from others; also, you must know and be able to answer questions on what you submitted. Otherwise, you won't get any mark for your submission.

Late Lab assignment submission

Submissions are through eClass and are time-stamped

- -10% penalty within 24 hours after deadline
- -30% penalty between 1 & 2 days after deadline
- -50% penalty between 2 & 3 days after deadline
- Submission later than 3 days after deadline will not be marked