A lot of changes for 427!

• **Waitlist overbooking**
  • *To ease your planning and team forming*
  • *Expected to go down to about 80 students (from 115)*

• **Fewer assignments**

• **Peer evaluation**

• **New game themes!**
CPSC 427
Video Game Programming

Instructor:
Helge Rhodin

Previous readings & WT2 section:
Alla Sheffer
Helge Rhodin
https://www.cs.ubc.ca/~rhodin/

- BSc and MSc at Saarland Univ., Germany
- PhD at the Max Planck Institute for Informatics
- Lecturer and postdoc at EPFL, Switzerland
- At UBC since Sep’19
Course Staff

Instructor:

- Helge Rhodin
  - Office hours: Tuesday 3-4 pm in ICCS X653 (or zoom room)
  - Email: rhodin@cs.ubc.ca (use Piazza for technical topics)

TAs:

- Floria Gu, Suzuran Takikawa, Luis
  - Contact via Slack
  - Office hours
    - Suzuran: Thursdays 1:30 - 2:30 pm in ICCS X337
    - Floria: Wednesdays 1:30 - 2:30 pm in ICCS X337
What is This Course About?

• **Basic Elements of Game Programming**
  • Content
    • Graphics: Modeling, Rendering, Animation
    • Gameplay: Situational response, User experience
    • …
  • Implementation
    • Game software design
    • *Writing and debugging efficient & robust* (runtime/memory) code
  • Project management/Teamwork
    • *Support software/Best practices*
What is This Course About?

! Writing your own game start to finish!

- Learning through experience
  - Programming
  - Teamwork
  - User experience (UX)
Topics NOT Covered:

**Interesting but no time:**

- Game design
  - *Storytelling*
  - *Game style/look*
- Deep dive into graphics, AI, UI, game engines …
- Asset creation tools
Prerequisites

CS:
• CPSC 221

MATH:
• one of MATH 200, MATH 217, MATH 226, MATH 253
• one of MATH 152, MATH 221, MATH 223

Strong math & programming background is encouraged

No prior graphics knowledge assumed
Web Resources

• Course Page: www.cs.ubc.ca/~rhodin/2023_2024_CPSC_427/
  Read & know all the course info + policies

• Piazza discussion forum
  • Please use for all technical questions;
  • Use private mode for questions to course staff that require posting code
  • Use private mode or email for personal issues

• Slack
  • For non-technical TA and team communication
Mechanical TA (MTA)

Web app
https://mta.students.cs.ubc.ca/
enrollment code: bd4a2b0d

• Polls in class

• Participation counter (virtual raise hand)

• Peer evaluation
Test poll - Game theme

A) *Non violent games, for ‘kids’*

B) *Randomness and surprise!*

C) *Time counts, 10 seconds!*
Course Project: Video Game

- 2D Game
- Basic template provided (very basic)
- Mandatory spec requirements (details in milestone documentation)
  - Shaders, 2D transformations, basic animation & gameplay, user experience validation (testing), efficient time/memory management
- Combined with advanced features selected from multiple options (details in milestone documentation)
- Written in teams of 6 (in exceptional cases 5 or 7, e.g., uneven number admitted from waitlist)
- Bi-weekly milestones, dates specified on calendar
- Completed games demoed to peers/expert jury
Cross Play Sessions

• Test / play the games of other teams

• In person, during tutorial slot
  • attendance mandatory

• Every team must provide three machines on which the game runs
Course Format

Course Hours:

• Lecture: Mo. 3 – 5 pm; Wed. 3 – 4 pm  
  • Some asynchronous content

• Tutorial:
  • Wed. 4-5 (first three weeks replaced by lecture)
  • Face2Face grading in later weeks
Course Format – Lectures & Tutorials

**Format:**

- **Lectures:**
  - *Regular lectures by instructor*
  - *Guest lectures by industry speakers*
  - *Team progress report meetings (one per milestone)*
  - *Cross-play sessions (starting from milestone 2)*
- **Tutorials:**
  - *Team meetings with TAs*
  - *Face-to-Face milestone marking (Overflow during Office Hours)*
    - *All* team members must be present for marking
Course Format – Interactive sessions

Progress report meetings

- One per milestone (the week after submission)
- Reports from each team (2min) on
  - Progress, achievements & challenges
  - Quick feedback round

Cross-play sessions for milestones 2, 3, 4

- One per milestone (week after each milestone)
- Collect playability feedback
- Feedback impacts bonus component of grade
Course Format

Tutorials

• Each team expected to meet with a TA once a week
  • Schedule TBD
  • Optional during marking weeks
• Face-to-face marking
  • Schedule TBD
  • During tutorials/office-hours
• Mapping of teams to tutors TBD

Contact TAs for any changes in your schedule, 3 days in advance!
Grading System: Team Project (78%)

- Game Pitch (1%) and Game Proposal (2%)
- Milestones: M1 19%, M2 19%, M3 19%, M4 19%
  - *Marked in face-to-face sessions with TAs*
  - Includes both demo and Q&A
  - *Includes cross-play feedback for M2-M4*
  - Up to 5% bonus based on feedback
- **Final exam replaced by juried cross-play session for M4**
  - *Mandatory attendance*
  - Demo to peers/industry jury (feedback used for grading)
  - Extra bonus marks provided for award-winning projects
  - based on jury/peer feedback
Grading: Team Project to Individual Grade

We expect all team members to participate in coding for ALL milestones

Individual Project Grade

• Grade computed by multiplying team grade by contribution quotient Q
  • Average contribution: Q=1
  • Below average Q < 1
  • Above average Q > 1
• Quotient determined based on self reporting, TA interaction, code repo analysis, and peer feedback
Grading System: 3 Individual Assignments (20%)

2%: peer grading A0: online at lecture start
- Entity Component System (ECS) and C++
- small but important, NEW: no solving, just grading

7%: Assignment 1: online at lecture start
- Basic rendering/event driven programming
  - Good for self-assessment before drop deadline

2%: peer grading A1 (NEW)

7%: Assignment 2:
- 2D animation and physics

2%: peer grading A2 (NEW)

!!! MUST PASS !!!
NEW: two instead of three assignments
Peer Evaluation

• 2-3 reviews for A0, A1, A2

A0: you grade example solutions (with errors from previous years)

A1 & A2: You grade peer submissions (anonymous)

• Will it help learning? Seeing alternative solutions is good.
• Will it reduce TA workload? We will validate peer reviews…
Peer Eval in MTA

• A detailed rubric, you mark which tasks are correctly solved

• TAs validating individual reviews
  • diverging grades will be resolved
  • randomized checks

• You can also flag inaccurate grading

• The accuracy of your peer grading is graded (2% points)!
Grading System: Individual

*Individual Progress Reports*

- Each student *must* submit a progress report for EACH milestone
  - Summary of work completed
    - achievements & challenges
  - Feedback on exceptional team-member performance
Grading System

1%: Classroom Participation

- Asking or answering a question in class via MTA.
- Answering poll question via MTA.
- Participating and providing feedback during cross-play sessions
Grading System: Individual/Team

1%: Game Pitches

- Written pitches due in the third week
- Individual or mini-team (up to 6 members)
TODOs: Individual

• Assignment 0 (individual, reading only)
• Read through course pages
• Register to Piazza

• Develop game ideas (not just one)
  • Write game pitch (just one)

• !!!! Team organizing !!!!
  • Use slack to find teammates and self-register your team on Canvas
TODO: TEAM

- Team organizing (use slack to connect), seek common game ideas, diversity of experience, *similar working hours*
  - *Initial teams: latest by the end of second week*

- We can help…

- Game Pitch (storyline + basic technical elements) – individual/mini-team
  - *Informal pitches on Slack: ASAP*
  - *Oral pitches:*
    - Plan on ~1 minute: game idea + team
    - Register on doc (linked form Piazza)
  - *Written pitches:*
    - More detailed plan on game features
## Course schedule

- **On course webpage**
- [https://docs.google.com/document/d/e/](https://docs.google.com/document/d/e/)...
Decorum: respect your classmates

Please come on time

• We will start timely
• Hint: we will have questions near start/end that count to class participation

Respect your team members

• Allow equal talking time
• Utilize strengths, compensate weaknesses, and plan ahead

Please no open screens

• Very disruptive for folks sitting around you
• stay focussed for your own benefit!
Your expectation?

4 min get-together break

- Say Hi
- Discuss any questions you may have about the course logistics
- Why do you take this course?
- What game do you want to build?

- Designate someone to take notes and report to class
Grounding your expectation
A course like any other with theory, concepts, assignments, deadlines…

not a piece of cake

90 % uphill

10 % downhill

Decide in the first week! The course is in high demand. No late drop forms
Special requirements?

*Let us know about ways we can support you in a private message or office hour.*
Schedule and deadlines

<table>
<thead>
<tr>
<th>Week &amp; Date</th>
<th>Content</th>
<th>Deadlines</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mon</td>
<td>Labor day</td>
<td></td>
<td>Helge Rhodin Floria</td>
</tr>
</tbody>
</table>
| Wed        | Lecture 1: Intro and logistics  
Tutorial 1: Setting up your development environment and git version control |                            | Floria & Suzuran (TAs) |
| 2 Mon      | Lecture 2: Entity component system (ECS)                               |                            | Helge Rhodin Floria |
| Wed        | Lecture 3: Game basics  
Tutorial 2: C++ for games                                               |                            | (TA)                |
| 3 Mon      | Lecture 4: HCI and user experience                                     | A0 review & drop deadline  | Helge Rhodin Floria |
| Wed        | Oral project pitch  
Tutorial 3: Assignment 1 walkthrough & Profiling C++                | Oral Proj. Pitch           | Suzuran (TA)        |
|            |                                                                        | Written Proj. Pitch        |                     |
| 4 Mon      | Lecture 5: Transformations and rendering                               | Proj. Proposal             |                     |
| Wed        | Lecture 6: Rendering pipeline and OpenGL  
Tutorial X: OpenGL reloaded (async. video)  
Tutorial: Face2Face proposal feedback |                            |                     |
| 5 Mon      | Truth & Reconciliation                                                 |                            |                     |
| Wed        | Lecture 7: Advanced OpenGL  
Tutorial 4: OpenGL profiling, Q&A                                       | Assignment 1               |                     |
| 6 Mon      | Thanksgiving                                                           |                            |                     |
| Wed        | Lecture 7: Collisions and simple physics  
Tutorial: Face2Face grading A1                                         | Peer review A1             |                     |
| Thu        | Guest lecture (makeup Monday)                                          | Milestone 1                |                     |
Syllabus (I)

**Graphics: Rendering**
- Basic Rendering: Rendering pipeline elements
- OpenGL / Event Driven Programming / Keyboard & Mouse input

**Graphics: Geometry**
- 2D Transformations
- Curves (in time & space)
- Meshes / Polygons

**Graphics: Collision detection**
Syllabus (II)

**Game UI/UX**

- Basics of User Interface Design
- Game interfaces/Game experience
- Testing
- Game balancing
Syllabus (III)

Game Software Design

• Entity Component Systems
• Observer Pattern
Syllabus (IV)

Gameplay Logic/AI

• State Representation
• Decision Trees

• Pathfinding (goal optimization)
• Heuristic Pathfinding/A*/MinMax
Syllabus (V)

Basic Physics

• Time stepping
• Euler integration
• Velocity & acceleration
• Particles & springs
Syllabus (VI)

**Efficiency/Tools**

- Debugging strategies and tools
- Profiling
- (In)efficient coding 101
- Compiler optimization
- Memory allocation
- Version control
Final poll - Game theme

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