

Game Architecture

98338 COGS-4550-01

Mondays, Thursdays 2:00PM - 4:00PM
Sage 2715

Instructor: Chris McEvoy, Chad Layton, Kevin Todisco

Office: Sage 3118

Email: clmcevoy [at] gmail.com, clayton [at] vvisions.com, ktodisco [at] vvisions.com

Office Hours: Mondays 4pm-5pm, Thursdays 4pm-5pm

Book: *Game Engine Architecture, 2nd edition*, by Jason Gregory

Course Description: This is a class on the composition of game engines, some of the most complex software applications that exist. We will discuss many features common to game engines, such as collision detection, event management, and virtual machines. The first three quarters of the class will be primarily lecture-based, covering topics needed for all game engines. The last quarter of the class will be primarily project-based, with individuals or teams focusing on an aspect of game architecture that they would like to expand further.

Learning Outcomes: Students will learn a more detailed understanding of the subsystems that comprise a game engine, and how they interrelate. Each student in the class will either create a minimalist game engine from scratch, or make a notable contribution to an existing open-source game engine.

Course Policies

Preparation and Attendance: Attendance is a really good idea, since we'll be covering a lot of ground from disparate sources. You will, of course, need to be present for your final presentation.

Academic Honesty: Student relationships are built on mutual respect and trust. Students must be able to trust that their teachers have made responsible decisions about the structure and content of the course and that they are conscientiously making their best effort to help students learn. Teachers must be able to trust that students do their work conscientiously and honestly making their best effort to learn. Acts that violate this mutual respect and trust undermine the educational process. They counteract our very reason for being here at Rensselaer and will not be tolerated. Any student who engages in any form of academic dishonesty will receive an F in this course and will be reported to the Dean of Students for further disciplinary action. The Rensselaer Handbook defines various forms of Academic Dishonesty and procedures for responding to them. All of these forms are violations of trust between students and teachers.

Please familiarize yourself with this portion of the handbook. *In addition to the violations listed within the handbook, I also do not tolerate multiple submissions of the same assignment to different classes.*

Gender-fair language: Because the way we speak and write affects the way we think, everyone in this course is expected to use gender-fair language in all discussions and writing. A guide to gender-fair language is available from the Writing Center and from the Library.

Grading: The first three quarters of the course will feature several homework assignments, and the last quarter of the class will be devoted to your unique game architecture project. Late penalty is 10% per 24-hour period after the submission deadline, up to a maximum of 50%.

Factor	Percentage of Grade
Homeworks	70%
Final Project	30%

Class Schedule

1/19	Intro	All	Role of engineering, structure of teams, scope of class, expectations for students	
1/23	Patterns 1	McEvoy	Main loop, job systems, time	
1/26	Patterns 2	Layton	Entities, serialization	
1/30	Math 1	Layton	Vectors, planes	Entities and jobs
2/2	Math 2	Layton	Transforms, quaternions	
2/6	Graphics 1	Todisco	Tour of the graphics pipeline	Mathlib for box game
2/9	Graphics 2	Todisco	Tour of the graphics pipeline	
2/13	Graphics 3	Todisco	End of graphics pipeline tour	
2/16	Graphics 4	Layton	Materials, lighting	Spinning, textured box
2/20	UI	McEvoy	Layout, rendering, text	
2/23	Physics 1	Todisco	Collision	ImGui for box game
2/27	Physics 2	Todisco	Rigid body dynamics	
3/2	Animation	Todisco	Bones, skinning, blending	Box hits floor
3/6	Scripting	McEvoy	VMs, compilers, visual script	
3/9	AI	McEvoy	Navigation, decision making, etc.	Box person walks

3/20	Audio	McEvoy	DSPs, mixing	
3/23	Networking	Morton	Topology, matchmaking, replication	AI controlled boxes
3/27	Tools	Stewart	Patterns, engine implications	
3/30	Pitch	All	Final project pitches	5 minute pitch
4/3	Debugging	Todisco	Power user tips	
4/6	Hardware	Layton	CPUs, GPUs, caches, optimization, profiling	
4/10	Integration	McEvoy	Build, version control, test	
4/13	Open studio			
4/17	Open studio			
4/20	Open studio			
4/24	Open studio			
4/27	Presentations	All	Final project presentations	10 minute presentation
5/1	Presentations	All	Final project presentations	10 minute presentation