Course Syllabus: IT265 - Game Architecture

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1. General Information

Course Number:	IT265
Course Title:	Game Architecture
Section(s):	002
Semester:	Spring 2025
Date & Time:	**002:** Tuesday/Thursday 11:30 am - 12:50 pm GITC 3200
Modality:	Face-to-Face
Credits:	3
Office Hours:	**CKB Public Area/Lounge Main Floor:** Monday/Wednesday 10 am - 11:20 am General availability on Discord via a provided communication channel

2. Overview

This course will be an introduction to and study of topics in game design and game system architecture. Students will work on various projects to study professional games, prototype game designs, and work on design treatments and documents. This course will provide a foundation for game development and design efforts in future classes.

3. Course Catalog

Prerequisites: CS 100 (https://catalog.njit.edu/search/?P=CS%20100) or CS 101 (https://catalog.njit.edu/search/?P=CS%20101) or CS 103 (https://catalog.njit.edu/search/?P=CS%20103) or CS 104 (https://catalog.njit.edu/search/?P=CS%20104) or CS 106 (https://catalog.njit.edu/search/?P=CS%20106) or CS 113 (https://catalog.njit.edu/search/?P=CS%20113) or CS 115 (https://catalog.njit.edu/search/?P=CS%20115) or BNFO 135 (https://catalog.njit.edu/search/?P=BNFO%20135). Course introduces students to the core concepts and design methodologies integral to designing and developing games and other Entertainment Software.

4. Instructor

Matt Toegel
Email: matthew.toegel@njit.edu
Discord: MattToegel
Github: MattToegel

5. Prerequisites

Prior knowledge is beneficial but not required however it's anticipated that students have a reasonable computing background (in addition to the Course Catalog Prerequisites). Students should be familiar with file system structure, running programs from the command line, installing programs, editing text files, etc.

If you are not well versed in these subjects, here are some resources that may help you get up to speed:

GCFGlobal - Basic Computer Skills (https://edu.gcfglobal.org/en/basic-computer-skills/)
Debugging: The 9 Indispensable Rules for Finding Even the Most Elusive Software and Hardware Problems (https://www.amazon.com/Debugging-Indispensable-Software-Hardware-Problems/dp/0814474578)
codeacademy - Operating Systems: Filesystems (https://www.codecademy.com/learn/operating-systems-filesystems)

6. Attending Class

6.1. Synchronous

Class will be held in the rooms and times given per your schedule from the registrar. Mostly, I'll be sharing my screen with everyone and going over the topics either via the classroom projector or a screen-sharing service. There will commonly be time in class to practice/discuss the topic for that day and/or get a headstart on homework. We'll be using Respondus for exams and everyone should ensure the software runs on at least 1 device (anticipate webcams will be required even in the classroom)

It's highly encouraged to ask questions and express any doubts/concerns throughout the course. I want to give everyone the opportunity to raise any concerns or ask any questions to make sure they're on track for the semester. Make sure to always keep in communication with me if there are any concerns about the class or anything related, this can be done via Discord (preferred), email, Canvas Inbox, etc.

7. Learning Outcomes

1. Students will define and analyze key concepts in game design, including gameplay mechanics, game balance, and player interaction.
2. Students will evaluate the impact of game aesthetics, such as color theory, mood, and themes, on player experience.
3. Students will design and prototype games by applying principles of game mechanics, depth, and complexity.
4. Students will develop and document game architecture using industry-standard practices, emphasizing structure, modularity, and maintainability.
5. Students will create and analyze game architecture documents, including design treatments, game design documents, and feature specifications.
6. Students will implement systems to create functional game components.
7. Students will explore and apply principles of level mechanics, including grid-based systems, logical flow, and interaction design.
8. Students will design intuitive user interfaces that enhance gameplay and user experience.
9. Students will apply AI concepts such as finite state machines and decision trees to create strategic or challenging gameplay.
10. Students will collaboratively plan, manage, and execute a semester-long game design project, creating both physical and digital prototypes.
11. Students will utilize tools such as GitHub and version control systems to document and manage project development effectively.

12. Students will present and critique game architecture documents, prototypes, and final projects, integrating feedback to refine their designs.

8. Illustrative Schedule

The schedule is a guideline and is subject to change to fit the particular instance of the class. All topics in general are planned to be covered. Some may have more focus than others and per class interest, other topics may be included.
Note: Some modules may span more than one week, but in general they'll be about 1 week in length and extra time later in the semester will go towards Project Topics and Questions.

Each Milestone will generally have 2 weeks to work on the specific requirements.

Module	Topics
Module 1: Introduction	• Course Overview • What is a game? • What is gameplay?
Module 2: Game Balance	• Player / Player Balance • Player / Gameplay Balance • Gameplay / Gameplay Balance
Module 3: Look & Feel	• Color Theory • Color Palette • Mood • Themes
Module 4: Game Mechanics	• Puzzles • Strategy / Tactics • Skill based challenges
Module 5: Depth Vs Complexity	• What is Depth? • What is Depth? • Randomness
Module 6: Making your First Game	• Planning • Project Management
Module 7: Midterm Milestone	• Game Design Treatment Due • Midterm Exam • Game Design Project Presentations
Module 8: Game Architecture	• Game Architecture Overview • Features of a Game Engine

Module	Topics
Module 9: Entity Based Systems	• What is an entity? • Entity behavior • Entity Interactions
Module 10: Level Mechanics	• Tile Systems • Parallax • 3D Geometry
Module 11: User Interfaces	• Control Methods • Layout • Framing / Overlays
Module 12: Actor Representations	• Sprites • Models • Armatures
Module 13: Artificial Intelligence	• Perceptions • Finite State Machines • Path Finding
Module 14: Particle Physics	• Particle Systems • Physics Engines
Module 15: Finale	• Final Deliverable • Final Exam • Game Design Documents Due • Final Project Presentations

9. Assignments

There will be periodic Case Studies about related topics along with assignments building out a design treatment and game design document, physical prototype, and digital prototype. Both prototypes will be demoed in class.

9.1. Dev Log

Students will utilize Github Markdown documents to keep a dev log. This will count towards the participation grades. Each week a new markdown document will be created and each log entry will be added to the same file in ascending order. These files will be in a specific folder on Github (noted in class and the homework submissions).

9.2. Semester-Long Project

There will be a semester-long project that the topics will build up to as we go through the semester. Concepts begin at the inspiration stage, go through design and planning stages, converge into a physical prototype, and end with a digital prototype.Throughout the process, projects will be presented and feedback will be gathered and utilized to adjust the individual projects.

9.3. Physical Prototype

The Physical Prototype will be an implementation of the core game concepts using affordable materials. Reasonable thought/effort must go into this for full credit. It should be "fully" playable at the time of the demo.

9.4. Digital Prototype

The Digital Prototype will be done in the language/engine preferred by the individual (most likely the instructor will utilize Unity but topics will be kept generic). After revisions from the physical prototype, students will digitize their projects offering a web-based way to play their game concept with multiple players on a single device. The concept will be published to itch.io or Github Pages if any issues arise.

9.5. Exams

All exams will use Respondus, so be sure to bring a compatible device with you on the day of the assessment. The midterm will take place during a regular class period and will cover the material from modules one to six. Exams will be closed book and must be taken in the classroom if the class is meeting face-to-face.
Any exams will be graded out of 100 points.

10. Grading

10.1. Breakdown

Participation/Attendance: 5%
Case Studies: 10%
Design Document Treatment: 5%
Game Design Project: 10%
Midterm: 15%
Design Document: 15%
Final Project/Demo: 20%
Final Exam: 20%

All points will be converted to a final percentage and letter grade at the end of the semester. Canvas will already have the weights applied.

10.2. Extra credit

Extra credit may be given for exceptional projects/assignments at the discretion of the instructor.

10.3. Grading Scale

Grade	Percentage Range
A	100% to 89.5%
B+	<89.5% to 84.5%

Grade	Percentage Range
B	<84.5% to 79.5%
C+	<79.5% to 74.5%
C	<74.5% to 69.5%
D+	<69.5% to 64.5%
D	<64.5% to 59.5%
F	Below 59.5%

11. Materials/Technologies

1. Game Architecture and Design 2nd Edition (https://a.co/d/8aVmFWM) will be used and referenced throughout the course as foundation concepts.
2. Additionally to better match industry trends and standards, this class will utilize online resources in lieu of a traditional textbook. Resources will be provided as the course progresses, but some primary resources are listed here:
    a. Github - Getting Startered (https://docs.github.com/en/get-started/start-your-journey/hello-world)
    b. Unity - Getting Started (https://unity.com/learn/get-started) (optional)
    c. Unreal - Basics (https://dev.epicgames.com/documentation/en-us/unreal-engine/understanding-the-basics-of-unreal-engine) (optional)
    d. HTML5 Canvas - Mozilla's Tutorial (https://developer.mozilla.org/en-US/docs/Web/API/Canvas_API/Tutorial) (optional)
    e. HTML5 Canvas - w3school's Tutorial (https://www.w3schools.com/graphics/canvas_intro.asp) (optional)
    f. Godot - Step By Step (https://docs.godotengine.org/en/stable/getting_started/step_by_step/index.html) (optional)
3. This class utilizes Canvas learning management system. You can find assignments, assessments, and learning resources there.
4. This class utilizes a platform for assignment evidence gathering and submission (provides clear objectives and generates a file to upload to Canvas for review).
    a. Students will access the worksheets through Canvas to fill in the required deliverables and the final submission will be uploaded to Canvas.
    b. The worksheets aim to maintain clarity of requirements for the student and for objective and fair grading.
5. This class will utilize the Respondus proctoring system for any/all exams.
6. Students are required to have a device that meets the YWCC minimum specifications (https://ist.njit.edu/student-computers-recommended-specs). They will need administrative acess to this device to install software. The device should be functional (charged, working) and brought to each class.
7. Students will utilize an installed IDE/engine (depends on personal choice; see links above).
8. This class has a GitHub page (https://github.com/MattToegel/IT265-2025) where you can find out how the course materials are built (when applicable).
9. Students will utilize itch.io or Github Pages to host a digital version of their project.
10. Students will utilize git and github for tracking development progress

a. This course will utilize the web UI mostly to keep it beginner friendly, but the below sources will be discussed for a more integrated experience if desired.

b. The first module's lessons will be dedicated to the setup of these resources and any naming conventions to follow

c. git for windows (https://git-scm.com/download/win)

d. git for mac (https://git-scm.com/download/mac) (Homebrew is recommended)

e. git for linux (https://git-scm.com/download/linux)

12. Policies

12.1. Academic Integrity

The work done is expected to be your own, any group work should clearly distinguish ownership of tasks. Use of snippets/material from others should be kept to a minimum and the source should be accredited where applicable.

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: academic integrity code (http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf).

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing, or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

12.2. Requesting Accomodations

If you are in need of accommodations due to a disability please contact the Office of Accessibility Resources & Services (OARS) (https://www.njit.edu/studentsuccess/accessibility), Fenster Hall Room 260 to discuss your specific needs. A Letter of Accommodation Eligibility from the OARS authorizing your accommodations will be required.

12.3. Resources for NJIT Students

NJIT Services for Students (https://docs.google.com/document/d/1xGO2qcVEF1tsOgZn-_W1LjSOKn_jhEVs9IWI_6jeuPs/edit?usp=sharing), including Technical Support

12.4. Class Etiquette

Students who are the most successful attend and participate in class. If you have questions, please ask them. This makes the class more dynamic and interesting for everyone.

12.5. Proctoring

NJIT policy requires that all midterm and final exams must be proctored, regardless of delivery mode, in order to increase academic integrity. Note that this does not apply to essay or authentic based assessments. Effective beginning Fall semester 2019, students registered for a fully online course section (e.g., online or Hyflex mode) must be given the option to take their exam in a completely online format, with appropriate proctoring.

Exams will be given in-person using Respondus. Be sure to bring your charged laptop and charger on the day of exams.

12.6. Late Policy

All deliverables will be eligible for a 5% penalty per day late, generally Canvas automatically has this set and will automatically apply it as grades are entered. Late assignments will automatically be marked by Canvas as a 0, but will be updated once grades are entered for the particular item.

Missed Exams will result in a 0.

If you are going to miss a class/material and cannot hand in an assignment, it's your responsibility to let me know as soon as possible so the situation can be handled.
There also will be no make-up exams (except, at the discretion of the instructor in the case of a documented medical or family emergency from the Dean of Students).
For any emergency please reach out to the **Dean of Students** (https://www.njit.edu/dos/student-absence-verification) so they can send out an official notice.

12.7. Attendance Policy

It's anticipated that students attend each scheduled session. Attendance will be recorded each class.

12.8. AI Usage Policy

The expectation of this course is for students to work through the course without assistance from any type of artificial intelligence to better develop their own skills in this content area. While, artificial intelligence (AI) is permitted in this course as a tool/aid, it is not permitted to be used to blindly complete assignments and/or generate full "solutions" in place of your own analysis and implementation. Additionally, if and when students use artificial intelligence in this course, the AI **must** be cited as is shown within the NJIT Library AI citation page for AI (https://researchguides.njit.edu/AI/cite). If and when used, failure to clearly disclose the usage of AI within the constraints of this policy will result in a zero for the entire assignment. Generally if the course contains code, there is an expected style, library, toolkit, etc (course material) provided that must be utilized.

13. Closing Notes

Syllabus is subject to change, attend class to stay current.

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