G O A

Student Program

Computer Science II: Game Design & Development

LENGTH OF COURSE: 14 WEEKS (Semester) or 7 WEEKS (Summer)

Course Overview

In this course, students practice designing and developing games through hands-on work. Through the creation of small "toys," the course asks students to solve problems and create content, building the design and technical skills necessary to build their own games.

Throughout the course, students come to understand game design through game designer Jesse Schell's "lenses:" different ways of looking at the same problem and answering questions that provide direction and refinement of a game's theme and structure. During this time, students also learn how to use Godot, the professional game development tool they use throughout the class. They become familiar with the methodologies of constructing a game using such assets as graphics, sounds, and effects, and controlling events and behavior within the game using the GDScript programming language, which is modeled after Python.

In the last two modules of the course, students work in teams to brainstorm and develop new games in response to a theme or challenge. Students will develop their skills in communication, project- and time-management, and creative

problem-solving while focusing on different aspects of asset creation, design, and coding.

Pre-requisites

Computer Science I: Computational Thinking or its equivalent. Experience with Python is helpful.

Competency-Based Learning

GOA courses use a competency-based learning approach in which students build both GOA core competencies and course-specific ones. Throughout the semester, we assess outcomes tied to each competency to track student progress with the goal of students leaving the course able to use and apply these competencies well beyond the final day of the semester.

Competencies and Outcomes

Collaborate with people who don't share your location.

- Connection: You collaborate with peers to design and develop games.
- Interaction: You actively listen to group members, ask questions in response to their ideas, share resources, and respond respectfully.
- Flexibility: You solicit and reflect on feedback from players of your game to modify and improve their experience.
- Teamwork: You openly acknowledge the contributions and roles of team members (artist, coder, designer, etc) in the game design process.

Reflect on and take responsibility for your learning and that of others.

- Feedback: Your feedback to others is timely and includes ideas about how they can act on your suggestions to improve their work.
- Preparation for future learning: You independently seek out and add techniques and methods to your skill set that enable better expression of your ideas and improved technical development.
- Iteration: You generate and apply specific ways to change your approach and improve the quality of your game.

Leverage digital tools to support and show your learning.

- Problem-solving: You apply computational thinking skills in the design and development of a game.
- Literacy: You apply the fundamental concepts and practices of game design, aesthetics, story, mechanics, and technology in your games.
- Connection: You analyze cultural and local factors that impact games produced across various contexts.

Semester Course Outline

GOA Orientation	
Every GOA course begins with a three-day orientation designed to introduce students to each other as well as to online learning skills and the Canvas classroom	
Weeks 2 - 3	Module 1: Beginning the Quest
COMPETENCIES: ● Collaborate with people who don't share your location. ● Leverage digital tools to support and show your learning.	
DESCRIPTION: In this module, you will be focusing on understanding the game design mindset, the tools you will be using in this course, returning to scripting and coding, and moving from basic exercises to applied programming. You will engage in discussions with your peers about what game design is, what brought you to the course, and the different roles in game development You will also be installing and learning a new set of tools and a programming language (GDScript) similar to what you learned in CSI (Python).	
EXAMPLE ASSESSMENT: "Beginning the Quest: Getting Equipped" will have you downloading the applications you'll need to build your games. You will also be bookmarking a number of websites to help you throughout the course, including documentation, tutorials, and asset resources. You will also find the Deck of Lenses that will guide your game design process.	
Weeks 4 - 5	Module 2: Getting Equipped for the Quest: Game Development Tools & Processes
COMPETENCIES: ● Leverage digital tools to support and show your learning. ● Reflect on and take responsibility for your learning and that of others. ● Collaborate with people who don't share your location.	

DESCRIPTION:
For this module, we begin to find our way through our quest! We'll be focusing on aesthetics and the player experience, the game development process, and creating and revising your second toy.

You'll be discussing with your classmates these lenses from the Deck of Lenses: Venue, Surprise, Fun, and the Elemental Tetrad. You'll also be talking about concept art – its role in the game design process, and you'll be sharing some examples from your Explore activity. You'll be providing feedback to one another about your second toy with the opportunity to act on that feedback.

You'll be exploring the key elements you need to know for making Toy 2, as well as some additional lenses to add to your understanding of different aspects of game design; you'll also be exploring and learning about concept art – how it's made, who's making it, where you can find it, and why it matters to the game design process. You'll also be researching the game development process, and the role of self-directed learning as practiced by game developers.

EXAMPLE ASSESSMENT:
You will be taking your notes and observations from your *Explore*: The Game Development Process activity and connecting them with your classmates via a synchronous conversation.

Weeks 6 - 7	Module 3: Preparing Maps for the Quest: Project Management & Documentation

COMPETENCIES:
- Collaborate with people who don't share your location.
- Reflect on and take responsibility for your learning and that of others.
- Leverage digital tools to support and show your learning.

DESCRIPTION:
In this module, we will cover the following, game design documents, foundations of project management, including common tools and related skills, GitHub and version control, and a synchronous critique of Toy 2.

You'll also be working on Toy 3, which gets into character/player movement, AI navigation, and more. Plus you'll be learning about some computer science practices and concepts you've probably never heard of.

EXAMPLE ASSESSMENT:
Toy 3 is going to be the first one where you have enemies. Or zombies. Or whatever you like - at the beginning, they're just going to be boxes or cubes running around. You'll have a character to control that can either chase or be chased by these enemies. And we're changing your perspective to an isometric point of view. It's a quasi-perspective view and it can be done either in 3D or 2D views. Both have their advantages and disadvantages and it will be your choice which approach you

choose. The Explore activity for this week will give you the foundations you need.	
Week 8 – Break	
Weeks 9 - 11	Module 4: Assembling the Fellowship
COMPETENCIES: ● Collaborate with people who don't share your location. ● Reflect on and take responsibility for your learning and that of others.	
DESCRIPTION: This module will feature your first collaborative project. It's a mini-game jam of a sort, but it's still essentially a toy. This is to keep expectations and scope low while you get attuned to working with your peers across time zones, cultures, and working methods. Your ability to respond and work in a timely way with your team members will be evaluated.	
EXAMPLE ASSESSMENT: This is a synchronous activity that, for this week especially, should take place as early as possible, which is why I'm giving it a smaller window than usual. This is where you will brainstorm Toy 4 and figure out what it's going to be. Just like the previous Toys, Toy 4 will have some parameters to keep your scope and timeline manageable, but it will have some features based on new concepts you're learning. During your conversation, you should also begin figuring out possible timelines and roles - these topics will spill over into Twist, so don't feel like you have to get everything figured out here.	
Weeks 12 - 16	Module 5: The Final Trial: Game Jam & Global Capstone
COMPETENCIES: ● Collaborate with people who don't share your location. ● Reflect on and take responsibility for your learning and that of others. ● Leverage digital tools to support and show your learning.	
DESCRIPTION: This is the final module. It's five weeks long, and it's the Game Jam you've been waiting for! It's also where you'll be documenting your role on the Jam for the GOA Global Capstone Exhibition – a broader community will be able to experience your game! You'll learn about post-processing filters and effects, the power of lighting in games, some examples of Global Capstone projects, and the Global Capstone platform itself. You'll also learn about a collection of lenses related to game worlds	

and characters, and you'll discuss how these lenses are connected to mobile and web-based games.
You'll continue building out your game as the jam continues into its second week, and you'll have a Global Capstone activity around getting feedback for your exhibit.

You'll conclude the game jam with the submission of your work and presentation to the Global Capstone. You'll discuss your Global Capstone presentation with your peers, and you'll explore some of the other presentations in the exhibition.

EXAMPLE ASSESSMENT:
By the deadline for this activity, you will have your game in a playable state. You will have a way for your player to start the game, you will have instructions, either in-game or as part of onscreen documentation explaining how to play it, and it should be as bug-free as possible. If certain parts of the game need to be deactivated, removed, or simplified to make it bug-free, you should do whatever is necessary.

The team leaders will merge the necessary branches to make a final build. Once this is done, proceed to the next Apply activity, where each of you will submit your game to the Global Capstone Summit, along with additional content specific to you.

Summer Course Outline

GOA Orientation
Every summer GOA course begins with a quick two-day orientation designed to introduce students to each other as well as to online learning skills and the Canvas classroom.
Module 1: Beginning the Quest
COMPETENCIES: ● Collaborate with people who don't share your location. ● Leverage digital tools to support and show your learning.
DESCRIPTION: In this module, you will be focusing on: ● understanding the game design mindset ● getting familiar with the tools you will be using in this course ● learning GDScript basics, building and deploying a game ● understanding Github basics and working with Github Desktop The work you'll be doing will cover the fundamentals of what your tools can do and how to use them, and the concepts you need to understand in order to actually begin making games.

EXAMPLE ASSESSMENT:
Beginning the Quest: Getting Equipped - will have you downloading the applications you'll need to build your games. You will also be bookmarking a number of websites to help you throughout the course, including documentation, tutorials, and asset resources. You will also find the Deck of Lenses that will guide your game design process.

Module 2: Getting Equipped for the Quest: Game Development Tools & Processes

COMPETENCIES:

- Leverage digital tools to support and show your learning.
- Reflect on and take responsibility for your learning and that of others.
- Collaborate with people who don't share your location.

DESCRIPTION:
This week, you'll embark on your first major project: creating a basic 2D game, Toy 1. This hands-on experience will introduce you to key Godot concepts and tools, including nodes, project settings, viewports, sprites, 2D physics, signals, and player input. You'll learn how to attach scripts to nodes, handle collisions using Rigidbody2D and KinematicBody2D, and work with velocity to make your game interactive and dynamic. By the end of this process, you'll not only have built your first game but also learned how to publish it to GitHub Pages.
In parallel, you'll dive into the six lenses from The Art of Game Design and apply these perspectives to games you've played in the past. Through a collaborative discussion with your peers, you'll explore how these lenses shape game design and how they can influence your own creations.
Looking ahead, you'll start preparing for Toy 2, a 3D game, by familiarizing yourself with advanced Godot features such as cameras, environments, lighting, 3D physics, and UI components. To complement your technical work, you'll explore the role of concept art in game development and curate a collection of both traditional and AI-generated artwork. This activity will highlight how AI can be used to enhance creativity while prompting reflection on its ethical implications.
Additionally, you'll participate in a sync meeting with your peers to exchange insights and ideas, fostering collaboration and inspiration.

EXAMPLE ASSESSMENT:
Apply: First Toy (Crafting) - This Apply activity is all about making! Equipped with the knowledge you acquired from the Explore activity for this week, you'll start crafting your first toy!

Module 3: Preparing Maps for the Quest: Project Management & Documentation

COMPETENCIES:

- Collaborate with people who don't share your location.
- Reflect on and take responsibility for your learning and that of others.
- Leverage digital tools to support and show your learning.

DESCRIPTION:

This week is all about expanding your technical, creative, and organizational skills as you develop Toy 2, a 3D game with exciting mechanics and features. You'll build a dynamic game where spheres bounce, interact, and disappear, complete with particle effects, sound, and a restart system.
To support your project, you'll delve into advanced Godot concepts such as isometric viewpoints, 2D and 3D character movement, autotiling, animation systems, and sound design. You'll also learn to manage scene transitions and follow best practices to keep your projects organized and efficient.
This module emphasizes the importance of planning and collaboration. You'll explore project management methodologies like Agile, Scrum, and Kanban, as well as tools like Trello, ClickUp, and Jira to help structure your workflow. At the same time, you'll deepen your understanding of Git basics to ensure your version control skills are solid.
Through a sync discussion with your peers, you'll share your Toy 2 progress and offer constructive feedback on each other's work. Finally, you'll create a comprehensive Game Design Document (GDD) for Toy 2, detailing every aspect of your game so that anyone could understand and build it.

EXAMPLE ASSESSMENT:
Apply: Crafting a New World (Toy 2)
In this assignment, you will use the Godot game engine to create a 3D toy where bouncing spheres spawn randomly, disappear with a particle effect and sound when tapped, and display a final score when all are removed. Your deliverables include a WebGL/HTML5 build on GitHub Pages, a screencast explaining and demonstrating your game, and sharing your links on Twist for collaborative learning.

Module 4: Assembling the Fellowship

COMPETENCIES:
- Collaborate with people who don't share your location.
- Reflect on and take responsibility for your learning and that of others.

DESCRIPTION:
In this module, you'll shift your focus to teamwork and project planning as you prepare for your next big project. This module covers key topics such as sound design, GUI animation, and Godot's animation systems, including state machines and animation trees. You'll also engage in meaningful discussions about the ethical and practical aspects of crunch culture and AI's influence on game development. By the end of this module, you'll be equipped with the tools and strategies to establish your team's operational foundations, setting the stage for collaborative success.

EXAMPLE ASSESSMENT:
Discuss: Crunch Culture:
In this assignment, you will engage in a discussion about crunch culture, its causes, impacts, and the role of AI in game development. Through an initial post and

responses to your peers, you'll reflect on your experiences, explore ethical considerations, and exchange perspectives on balancing productivity, well-being, and technological advancements in the gaming industry.
Module 5: The Final Trial: Game Jam
COMPETENCIES: • Collaborate with people who don't share your location. • Reflect on and take responsibility for your learning and that of others. • Leverage digital tools to support and show your learning.
DESCRIPTION: This is the final module, spanning three weeks, and it's the highly anticipated Game Jam! You'll explore post-processing filters, effects, and the impactful role of lighting in games. Additionally, you'll delve into a set of lenses focused on game worlds and characters, discussing their relevance to mobile and web-based games. As the jam progresses, you'll continue developing your game, participate in an activity to gather feedback on your prototype during the second week, and wrap up the third week by submitting your final game.
EXAMPLE ASSESSMENT: Apply: Final Game In this activity, your game should be in a playable state. It must include a way for players to start the game, clear instructions (either in-game or as on-screen documentation), and be as bug-free as possible. If certain features need to be deactivated, removed, or simplified to ensure a bug-free experience, make the necessary adjustments. Team leaders will merge the required branches to create the final build.

Required Materials

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Material / Access / Cost:

- Godot 4.2.1 / Digital download / No purchase needed
- GitHub / Internet browser / Free account creation required
- Learn to Code with Godot (or web-based alternative) / Digital download / No purchase needed
- A Deck of Lenses / Internet browser / No purchase needed