CST 426 – Advanced Game Development

# Course Overview

## Catalog Description

This course provides students with advanced game development skills. Students will learn how to develop procedural content generation techniques for various platforms, and advanced game input techniques . Students will also learn how to apply gamification techniques to serious games development. Additionally, the course discusses ethical considerations in game development, develops interpersonal and oral communication skills, and game design document writing skills.

**Prerequisites**: CST325 (formerly CST320), or Instructor's consent

## Instructor Information

Name: Drew A. Clinkenbeard, PhD

Email: dclinkenbeard@csumb.edu

Office: ~~BIT 215~~ Zoom:

### Office Hours:

MW TTh F By appointment

## Meeting Time and place

Lecture: Mon / Wed 10:00AM – 11:50AM

Zoom Link:

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## Texts

**Advanced Game Design A Systems Approach**

Michael Sellers

[O'Reilly Books Online](https://learning.oreilly.com/library/view/advanced-game-design/9780134668185/contents.xhtml)

ISBN-13: 978-0134668185

**Game Programming Patterns**

Robert Nystrom

[gameprogrammingpatterns.com](http://gameprogrammingpatterns.com/)

ISBN-13: 978-0990582908

**Games, Design and Play: A Detailed Approach to Iterative Game Design**

Colleen Macklin; John Sharp

[O'Reilly books online Link](https://learning.oreilly.com/library/view/games-design-and/9780134392233/ch01.html)

ISBN-13: 978-013439207

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# Course Context

## Course Outcomes

This course is designed to develop the students programming, problem solving, and academic skills through the application of the following learning outcomes.

## Course Learning Outcomes:

1. Advanced game programming skills
   1. Develop proficiency in the C++ programming language
   2. Discuss and apply procedural content generation
   3. Discuss and apply design patterns to design computer games
2. Game design and System thinking
   1. Discuss and apply system thinking in regard to in game economies
   2. Analyze systems in current games
   3. Plan and build game systems that model real life and/or complex systems
   4. Create, Discuss, and Analyze game design document
3. Critique, Prepare, and Evaluate Professional Communication
   1. Analyze, plan, and review game design documents
   2. Prepare and present information about projects
   3. Critique and assess other student work, including presentations.
4. Evaluate, Explain, and Apply team management skills
   1. Establish clear team roles and expectations
   2. Set realistic milestones
   3. Peer-review and evaluation
   4. Effective communication
   5. Project management
5. Gamification techniques to serious games development
   1. Describe gamification techniques to increase user engagement in serious games
6. Analyze and Explain ethical considerations in game development

## Course Audience

This course is intended for students with senior standing or equivalent experience. This is a technical course that relies on inquiry-based learning techniques. Students are expected to spend **a minimum of seven hours a week working outside of class time**. This includes researching technical skills, working with teams, reading, and writing.

Students are expected to have proficiency with the Unity Game engine as well as a familiarity with the C++ programming language.

## Minimum Technical Skills

For this course students are expected to be proficient[[1]](#footnote-0) in the following areas

* Ability to communicate clearly through writing.
* Access to and Understanding of browsers like Chrome, Firefox, and Safari
* Ability to perform an online search with keywords for text and images
* Ability to make and share screenshots
* Ability to record and share videos (i.e. via Zoom)
* Familiarity with iLearn
* Ability to access and create Google Sheets, PDFs, and PowerPoint decks
* Ability to access and use: Unity Game Engine, Visual Studio Code (or equivalent IDE)
* Ability to read and write C# and C++ programming languages

## Recommended Technical Skills

* Proficiency with Git and github

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## Technology Requirements

* Consistent internet connectivity
* Dependable computer
  + Specifically, a computer capable of running (at least) Unity Game Engine
  + Compiling C++ and C#
* Computer able to create and share screenshots
* Computer able to create and share screen recordings
  + specifically, recorded zoom sessions
* Access to a web browser like Chrome, Firefox, or Safari
* Ability to access use/create online programs in Google Apps
  + e.g. Google Sheets, Slides, YouTube
* Ability to access and consume online documentation
  + such as Stackoverflow.com, wikipedia.org, etc.

## Recommended Technology:

* Microphone
* Webcam
* Non web-based operating system
  + i.e. Chromebooks don’t work for this class

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# Course Focus

This course is designed as a practical exploration of advanced game design. In this context advanced game design means a systematic evaluation of game systems and the theoretical and mathematical processes that make games run, enjoyable, and successful.

## System Thinking

* A computer game is complex system designed to simulate reality[[2]](#footnote-1) students will explore techniques to analyze and develop these simulations

## Test Driven Development

* Each project will be required to have a certain number of tests
* A certain percentage of these tests must pass

## Incrementally evolve complexity over time.

* Students are guided through the designing and implementing a software project
* Students add complexity to projects as the course progresses

## Game Design in Teams

* Each project will be completed with a different team.
* Teams are expected to demonstrate good communication

## 

## Specific course outcomes are:

* Use system and design thinking to analyze and develop advanced game ideas.
* Create procedurally generated content such as: cities, landscapes, forests, caves as well as quests and puzzles
* Procedurally generate animations from input data, motion capture, or image data
* Model behaviour of non-player characters, including navigation, intelligent reactions to events, such as collisions
* Model player actions and apply it to game difficulty management
* Use basic dynamic programming (machine learning) techniques, such as Dynamic Time Warping, to recognize motion gestures based from time-sequenced sensor data.
* Time and task management. Including interpersonal communication and creation and maintenance of design documentation.

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# Course Policies

## Course Website

<http://ilearn.csumb.edu/> Additional course information and announcements will be available on this site. It is the student’s responsibility to check this site frequently.

## Course Schedule

For more detail see the [schedule](https://docs.google.com/spreadsheets/d/1Z4IB_RVl8I9anyIUjx61e_-ouhVAnqwpHsJAgFzebHM/edit?usp=sharing) (I am ~~lazy~~ efficient and didn’t want to duplicate the work)

([https://docs.google.com/spreadsheets/d/1Z4IB\_RVl8I9anyIUjx61e\_-ouhVAnqwpHsJAgFzebHM/](https://docs.google.com/spreadsheets/d/1Z4IB_RVl8I9anyIUjx61e_-ouhVAnqwpHsJAgFzebHM/edit?usp=sharing) )

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# Course Activities and Resources

* **Lectures.** This course includes lectures and labs each week. The weekly interactive lectures will cover course material and concepts in-depth.
  + Lectures will be recorded and posted within ~36 hours of class time.
* **Homework and Labs**. Each week we will have 2-3 assignments. These assignments will be denoted as either Solo or Group
  + **Solo Assignments:** these are traditional homework and should be done on your own.
  + **Group Assignments:** these are intended for your whole group. Generally, only one person needs to submit these, and the grade is assigned to the entire group.
* **Quizzes:** There are 2-4 quizzes each week. A quiz on the weeks reading material must becompleted tounlock the rest of the week. The quizzes will have questions from the readings as well as on course material. Each quiz will have a 10-minute timer and will be a single try.
* **Projects:** Most of the work in the course will be in the form of projects and project management. There are three group projects in this course.
* **Presentations:** Each student will be responsible for at least two presentations in this class. These represent a significant portion of the grade in this class. Do not miss them. A significant portion of your grade for presentations will come from evaluating OTHER STUDENTS’ PRESENTATIONS.
* **Exams:** There will be a midterm and a final in this course. Both will involve questions about the technical aspects of this course.
  + Exam 00 will address the topics covered in weeks 01-05
  + Exam 01 will address the topics covered in weeks 01-09
  + Final exam will be comprehensive
    - Taking the final exam is a required condition for completing the course.
  + No makeup exams will be allowed, except in extreme emergency cases. Students are advised to let the instructor know beforehand, if possible.

## Homework/Labs

* Programming assignments will be given throughout the semester.
* Late submissions will not be accepted.
* Typically homework is due by 11:55pm Friday on the week it was assigned

## Projects and Presentations

There is one major project for this course. The project tasks the students with designing and implementing a game that demonstrates concepts covered in this course. Part of the project involves the creation of design documents and presenting progress to the class.

There will be at least 2 presentations in this course

1. Project Proposal Presentation
2. Final Project Presentation

## Quizzes

There will be a quiz every session at the beginning of the class.  
Missed quizzes may not be made up.

## Labs

Labs will generally involve C++ and/or the Unity Game engine. Some assignments will require the use of other languages. Some labs are open for the student to choose.   
*However*, **the technology should be appropriate for the task.**

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# Grading Policy

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Title** | **Item** | **Totals** |
| Project 01 | Milestones | 10% | 25% |
| Game Quality | 5% |
| Presentation | 10% |
| Project 02 | Proposal | 5% | 30% |
| Milestones | 10% |
| Game Quality | 5% |
| Presentation | 10% |
| Labs | Labs | 10% | 10% |
| Exams | Exam 00 | 5% | 15% |
| Exam 01 | 5% |
| Final Exam | 5% |
| Homework | Homework | 10% | 10% |
| Quizzes | Quizzes | 10% | 10% |
|  |  |  | 100% |

|  |  |  |
| --- | --- | --- |
| **Grade Distribution** | | |
| A+ |  | >100% |
| A | 100% | 93% |
| A– | <93% | 90% |
| B+ | <90% | 87% |
| B | <87% | 83% |
| B– | <83% | 80% |
| C+ | <80% | 76% |
| C | <76% | 70% |
| D | <70% | 60% |
| F | <60% | 0 |

Students shall obtain a letter grade of C or better to satisfy graduation requirements. Receiving a D or below will require retaking the course in order to count it toward the degree requirements.

## Attendance

Students are expected to be regular and punctual in class attendance. Students are responsible for all materials covered in lectures and labs.

## General

In general code must RUN. If submitted code does not compile I reserve the right to assign a score of 0. Likewise arriving unprepared to present is grounds for a score of 0.

# University Policies

## Academic Honesty

Academic honesty is highly valued at CSUMB. Participants must always submit work that represents their original words, ideas, and design. Forms of academic dishonesty include: cheating, fabrication, plagiarism, and collusion in any of these activities. All relevant sources must be cited and, when appropriate, permission to use the work must be obtained.

We value informal resolution of academic integrity allegations; however, students discovered to have engaged in academic dishonesty will be sanctioned. Please see the CSUMB Catalog for more information about academic honesty, including consequences of academic dishonesty:<http://policy.csumb.edu/site/x20830.xml>

## Accommodation

The workshop and the resources utilized have been made accessible as possible. iLearn uses Moodle LMS which complies with all major international standards in the area of accessibility.

If you need accommodations please contact the SDR office in the first week of classes or sooner. For additional accessibility accommodations, please refer to Student Disability Resources at [http://sdr.csumb.edu/](http://sdr.csumb.edu/student-disability-resources)  email: student\_disability\_resources@csumb.edu, phone

## Academic Support (CLC)

The Cooperative Learning Center (CLC), a campus-wide tutoring program, is free and open to all students and offers peer tutoring services and workshops. It seeks to provide high-quality learning assistance in computer technology, math, science, writing, languages and study strategies aimed at enhancing learning needs at all ability levels. CLC works with students to expand their knowledge and abilities by empowering them to become independent learners. CLC tutors, staff, and faculty work together to design and offer effective, collaborative, and active learning experiences. We provide tutors with the opportunity to develop teaching, leadership, and communication skills. CLC is located in the Library, 2nd floor, (831) - 582 - 4104 (clc@csumb.edu) <https://csumb.edu/academics/academic-support-services>

## Student Support Services

[Link](https://csumb.edu/library) to the Library

[Link](https://csumb.edu/library/articles-databases) to CSUMB Library Online Journal Articles

[Link](http://csumonterey.bncollege.com/webapp/wcs/stores/servlet/BNCBHomePage?storeId=19063&catalogId=10001&langId=-1) to the Bookstore

[Link](https://csumb.edu/clc) to Cooperative Learning Center

[Link](https://csumb.edu/health) to Student Health Center

[Link](https://csumb.edu/recreation) to Student Recreation Center

[Link](https://csumb.edu/outdoor) to Outdoor Recreation

[Link](https://csumb.edu/policy/enrollment-and-registration-policy) to Enrollment & Registration Policies

* [Affordable Learning Solutions](http://als.csuprojects.org/)
* [Food Pantry](https://csumb.edu/as/food-pantry)
* [Otter Eats](https://csumb.edu/basicneeds/otter-eats)
* [Basic Needs Referral Form](https://csumb.edu/basicneeds)
* [Otter Outfitters](https://csumb.edu/womensleadershipcouncil/otter-outfitters)
* [Campus Advocate](https://csumb.edu/campusadvocate)
* [On campus jobs for students](https://csumb.edu/career/otter-jobs-student-access)
* [Information from PGCC on supporting emotionally distressed students](https://csumb.edu/pgcc/emotionally-distressed-students-0)

## Veterans and Active Duty Personnel

Veterans, active duty military personnel with special circumstances (e.g., upcoming deployments, drill requirements, disabilities) are welcome and encouraged to communicate these, in advance if possible, to the instructor. (831) - 582-5720

## 

## Freedom from Discrimination and Harassment

CSUMB is committed to creating and sustaining an environment free of discrimination, including sexual misconduct, dating and domestic violence, and stalking. If you experience discrimination of any kind, CSUMB encourages you to utilize the resources described below. Note that any CSUMB staff or faculty member, other than the campus advocate or PGCC counselors, who are told about student experiences of misconduct must report all known information to the Title IX/DHR office.

To report any type of discrimination:

*Title IX/DHR* (Discrimination, Harassment & Retaliation), 831-582-3510 email: wensmith@csumb.edu (Email is recommended for fastest response)

To report discrimination as a crime and/or safety assistance:

*University Police Department*, emergencies: 911, non-emergencies: 831-655-0268 For confidential support:

*Campus Advocate/Monterey County Rape Crisis Center*, call or text: 831-402-9477, 24 hour crisis line: 831-375-4357

*Personal Growth and Counseling Center (PGCC)*, call 831-582-3969

## Wellness

CSUMB believes that wellness matters. As a college student, you may sometimes experience problems with your wellness that interfere with academic success and negatively impact daily life. An important part of college is learning how to respond to these problems and seek guidance. To learn more about departments within Health & Wellness Services that can support you in achieving and maintaining physical, mental, emotional, and spiritual wellness, go to csumb.edu/hws.

Did you know that there are only 168 hours in a week? According to the Centers for Disease Control and Prevention (CDC), adults ages 18 to 60 years old need to be getting seven or more hours of sleep every night, which means there are only 119 hours to connect with family and friends, honor work and school responsibilities, exercise and eat, as well as pursue your passions. **Make sure you are taking care of yourself!**

## Privacy and Accessibility Statements

For use of external technologies, you will find the following links to their **privacy policy:**

[YouTube Privacy Policy](https://www.youtube.com/static?gl=US&template=privacy_guidelines)

[Google Apps Privacy Policy](https://www.google.com/intl/en/policies/privacy/)

[FERPA](https://csumb.edu/iar/ferpa-glance/)

[For our LMS called iLearn which is Moodle](https://moodle.org/mod/page/view.php?id=8148)

**Accessibility** of materials in this course are as follows:

* Alt text is provided on all images
* Headings are used to facilitate screen readers
* YouTube Videos have closed captions (student examples use generic closed captions).
* [Google Apps like Docs and Sheets have accessibility features for screen readers](http://www.google.com/accessibility/all-products-features.html)
* Google Add Ons has a voice recognition feature

This is a free screen reader- Natural Reader a [Screen reader for Mac or Windows](http://www.naturalreaders.com/download.html)

[Introduction video on Natural Reader](https://vimeo.com/222434433)

Watch this [video on how Natural Reader can help.](https://www.youtube.com/watch?v=6qkqJNhmzFs)

[LMS (Moodle) Accessibility](https://docs.moodle.org/dev/Accessibility_notes#Web_Content_Accessibility_Guidelines_1.0)

Your instructor would like permission to use your coursework submissions for the purposes of educational, instructional and institutional scholarship in an effort to improve the class. An activity requesting your permission will be embedded in class called Acknowledgment Survey.

1. I think of proficient as being able to use the language or software without having to lookup a tutorial [↑](#footnote-ref-0)
2. Though this may be a fictional reality… [↑](#footnote-ref-1)