

# CS 481, CS 681 Advanced Computer Game Design

## MW: 2:30 - 3:45 p.m., SEM 344

Sushil J. Louis  
<http://www.cse.unr.edu/~sushil/class/games>

### Catalog Description

#### CS 481/681, Advanced Computer Game Design (3+0) 3 credits

The engineering, science, and art in creating advanced computer games. Design and implementation of game components in producing useable and engaging computer games. Prerequisite: CS381

### Introduction

We will study the technology, science, and art involved in the creation of computer games. The course will emphasize hands-on development of games. We will study a variety of software technologies relevant to games including programming languages, scripting languages, operating systems, file systems, networks, simulation engines, and multi-media design systems. We will also study some of the underlying scientific concepts from computer science and related fields including: simulation and modeling, graphics, artificial intelligence, real-time processing, and game theory. Finally, we will study the art and design principles for developing useable and engaging games including: software engineering, human computer interaction, thematic structure, graphic design, choreography, music and sound effects, and game aesthetics.

The course will include visiting lectures and a variety of group projects. The group projects will involve system implementation, but emphasize design and use of existing tools. The final group project will require the students to go through all phases of system conceptualization, specification, design, implementation, and evaluation.

### Instructor

**Sushil J. Louis:** SEM 233 (784-4315), [sushil@cse.unr.edu](mailto:sushil@cse.unr.edu),  
<http://www.cse.unr.edu/~sushil/>

- **Office Hours**

- MW: 11:00 - Noon
- T: 1:00 - 3:00
- And by appointment (email [sushil@cs.unr.edu](mailto:sushil@cs.unr.edu) for an appointment)

### TextBook

- **Required:** There is no required textbook for this course.
- **Recommended:** Creating Emotion in Games: The Craft and Art of Emotioneering by David Freeman, Will Wright. New Riders; 1st edition (September 15, 2003)
- **Recommended:** Chris Crawford on Game Design by Chris Crawford. New Riders Games; 1st edition (June 18, 2003)

- **Recommended:** Developing Games in Java by David Brackeen (Author), Bret Barker, Laurence Vanhelswue. New Riders; 1st edition (August 14, 2003)
- **Recommended:** Game Architecture and Design, Rollings and Morris, Coriolis Publishing.
- **Recommended:** Game Design: The Art and Business of Creating Games, Bates, Prima Tech.
- **Recommended:** Andrew Rollings and Ernest Adams on Game Design: Rollings and Adams, New Riders.
- **Recommended:** Game Design: Theory and Practice, Rouse, Wordware Game Developer's Library.
- **Recommended:** 3D Game Engine Design, David H. Eberly, Morgan Kaufmann.
- **Recommended:** Game Programming Gems 1, 2, 3, Mark DeLoura, Charles River Media.

## Course Objectives

Students will demonstrate an understanding of the principles of game software architecture and design by completing game engineering assignments and project.

How does this relate to National Standards about what Students in Computer Science should know? The section below lists the criteria by which students will be judged.

## ABET Criteria 3 outcomes

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to design a system, component, or process to meet desired needs
- an ability to function on multi-disciplinary teams
- an ability to identify, formulate, and solve engineering problems
- an understanding of professional and ethical responsibility
- an ability to communicate effectively
- the broad education necessary to understand the impact of engineering solutions in a global and societal context
- a recognition of the need for, and an ability to engage in life-long learning
- a knowledge of contemporary issues
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

In addition, our Department has specific objectives for our students:

## Computer Science Program Objectives:

Our graduates will have achieved:

1. a broad general education assuring an adequate foundation in science and mathematics relevant to computing.
2. a solid understanding of concepts fundamental to the discipline of computer science.
3. good analytic, design, and implementation skills required to formulate and solve computing problems.
4. the ability to function, communicate, and continue to learn effectively as ethically and socially responsible computer science professionals.

## Computer and Information Engineering Program Objectives:

Within 3 to 5 years of graduation our graduates will:

1. be employed as computer engineering professionals beyond entry level positions or be making satisfactory progress in graduate programs.
2. have peer-recognized expertise together with the ability to articulate that expertise as computer engineering professionals.
3. apply good analytic, design, and implementation skills required to formulate and solve computer engineering problems.
4. demonstrate that they can function, communicate, collaborate and continue to learn effectively as ethically and socially responsible computer engineering professionals.

## Course Outcomes

Now we can relate national criteria and departmental objectives to this course's outcomes. That is, what do I expect from you when you finish the course and how will we measure whether you know what you are expected to know.

Students will demonstrate an understanding of the principles of game software architecture and design by completing game engineering assignments and project.

1. Students will understand principles of game software architecture
  - **Assessment Method:** Create a game engine from existing graphics, physics, and artificial intelligence components
  - CS Program objectives impacted: 2, 3
  - CIE Program objectives impacted: 2, 3
  - ABET Criterion 3 outcomes: 3, 5, 7
2. Students will understand principles of game software design
  - **Assessment Method:** Implement games in assignments and project
  - CS Program objectives impacted: 2, 3
  - CIE Program objectives impacted: 2, 3
  - ABET Criterion 3 outcomes: 3, 5, 7

## Topics

1. Aug 24: Get acquainted, introductions.
2. Review of History of Computer Games and Game Design principles
3. Pygame - Pong
4. 2D games
5. Game Design Process
6. Game Design Principles
7. 3D games
8. Python-Ogre

9. Networking for Computer Games
10. Artificial Intelligence
11. Ethics in Computer games

## Assignments, Presentations, and Project

- August 24: Assignment: Pick a computer game and write a critique. Address art, sound, animation, gameplay, physics, artificial intelligence, and what appeals to you and what does not.
- Sept 2: Assignment: Design and implement a simple arcade style game
- Sept 21: Assignment: Design and implement a racing game
- Oct 21: Project start
- Oct 24: Project brainstorming, prepare pitch
  - Oct 26: Pitch Day - make a game pitch. Attract group members
  - Nov 2: Presentations: Game Concept
  - Nov 16: Assignment: Design Document Due
  - Dec 2: Presentation: Internal Game Demos
  - Dec X: Presentation: Gaming open house Presentation and Demo

## Graduate component

Graduate students will achieve deeper understanding of the material presented by being given additional readings and additional work in all course assignments and projects.

All assignments, projects, and presentations, except for the first two, must be done in groups. Any group with a graduate student is a graduate group. Graduate groups will also have to complete portions of the assignments and projects clearly identified in the assignment and project handouts. For example, in designing an arcade game, graduate groups will design the game with multiple levels. An undergraduate groups will need only design one level.

## Grading

You will be evaluated on course assignments (40%), class presentations (30%), and final project demonstration (30%). We will be using the +/- grading system.

## Disability Statement

The Department of Computer Science and Engineering supports providing equal access for students with disabilities. I am available to discuss appropriate academic accommodations that students may require. Please meet with me at your earliest convenience to ensure timely and appropriate accommodations.

### 0.1 Late Policy

No late assignments will be accepted.

## Attendance

All students are expected to attend **all** scheduled classes.

## **Sharing**

You are encouraged to discuss ideas and techniques broadly with other class members, but not the specifics of assigned problems except as part of group projects. Sharing of code or intermediate designs is expressly prohibited. Read the code of student conduct at <http://www.unr.edu/stsv/acdispol.html>. All write-ups, reviews, documentation, and other written material must be original and may not be derived from other sources.

## **Guest Lectures**

From time to time we will have invited speakers to give us a talk related to this course. The class may then meet at another location. I will notify the class when we such a lecture and I will post a message on our web page.

## **Communications**

If I need to communicate with the class as a group I'll post a message on our web page. You are required to check the class web page and your email every day. The class web page is at:

<http://www.cs.unr.edu/~sushil/class/games/index.html>