University of Nevada, Reno

Department of Computer Science and Engineering
CPE 481/681 - EMBEDDED AND CONSOLE GAMES DEVELOPMENT
Fall 2014

Catalog Data: Computer game development with emphasis on embedded systems and game consoles with fixed resources. Evolution of video display, computer sound, and game I/O technologies. Prerequisite: CPE 301

Textbook: To be determined at the first class.

References: *Game Programming All in One*, Jonathan Harbour, Third Edition, Thomson Course technology PTR, (October 2006) copyright 2007.
Beginning Game Programming, Jonathan Harbour, Thomson Course technology PTR, 2005.
Beginning Open GL Game Programming, Dave Astle and K. Hawkins,Thomson Course technology PTR, 2004.
The Game Maker's Apprentice, Jacob Habgood and M. Overmars, Apress, 2006.

Instructor: Dwight Egbert, Professor of Computer Science and Engineering

Office Hours: 11:30 AM - 1:00 PM Mon. & Wed. or by appointment, SEM 322, (702) 784-6952, egbert@cse.unr.edu

Course Goals: This course is designed to provide the basic principles of video display, machine generated sound synthesis, and game input/output technologies used for embedded and console computer games as they have evolved. Each student will develop an embedded or console project which can be either hardware or software centered. This computer game project plus three or four small demonstration projects are to be completed.

Academic Services:
Your student fees cover usage of the Math Center (784-4433 or www.unr.edu/mathcenter/), Tutoring Center (784-6801 or www.unr.edu/tutoring/), and University Writing Center (784-6030 or www.unr.edu/writing_center/. These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student.

If you have a disability for which you will need to request accommodations, please contact me or Mary Zabel at the Disability Resource Center (Thompson Student Services – room 100, 784-6000, or www.unr.edu/drc/), as soon as possible to arrange for appropriate accommodations.

Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.

Prerequisites by Topic:
1. Assembly language programming experience.
2. Basic understanding of digital hardware.
3. Basic understanding of microprocessors.
4. C/C++ programming experience
5. Basic WINDOWS & UNIX skills.

Topics:
1. Evolution of embedded and console game systems.
2. Evolution of video display technology.
3. Evolution of machine generated sound.
4. Computer game design tools.
5. Input/Output techniques and devices.
6. Interrupt processing for Input/Output.

7. Timer control of game dynamics.
8. Game controller design

Course Outcomes:
The course outcomes are skills and abilities students should have acquired by the end of the course. These outcomes are defined in terms of the Computer Science and Engineering ABET Accreditation Program outcomes which are relevant to this course. All outcomes are listed below and those relevant to this course are identified in the following Table.

1. an ability to apply knowledge of computing, mathematics, science, and engineering.
2. an ability to design and conduct experiments, as well as to analyze and interpret data.
3. an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs, within realistic constraints specific to the field.
4. an ability to function effectively on multi-disciplinary teams.
5. an ability to analyze a problem, and identify, formulate and use the appropriate computing and engineering requirements for obtaining its solution.
6. an understanding of professional, ethical, legal, security and social issues and responsibilities.
7. an ability to communicate effectively with a range of audiences.
8. the broad education necessary to analyze the local and global impact of computing and engineering solutions on individuals, organizations, and society.
9. a recognition of the need for, and an ability to engage in continuing professional development and life-long learning.
10. a knowledge of contemporary issues.
11. an ability to use current techniques, skills, and tools necessary for computing and engineering practice.
12. an ability to apply mathematical foundations, algorithmic principles, and computer science and engineering theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
13. an ability to apply design and development principles in the construction of software systems or computer systems of varying complexity.

ABET Criterion 3 Outcomes	Course Outcomes	Assessment Methods/Metrics	CS Program Objectives Impacted	CIE Program Objectives Impacted
1	Students demonstrate that they can define and understand the fundamental physics of video game systems.	Students must be able to work with a variety of video game systems and to do so must understand the common underlying physical principles.	1, 2	1, 3
3	Students demonstrate that they can apply fundamental concepts through the design and implementation of specific applications.	Students must be able to implement video game design specifications for several embedded and console systems.	2, 3	1, 3
9	Students demonstrate that they are aware of and understand past, present, and potential future video game technologies.	Students demonstrate that they can obtain and understand the pertinent operating specifications for new video game systems when needed.	4	4
10	Students demonstrate that they are aware of contemporary video game topics and market activity.	Students must be able to use and understand concepts which are implemented in current commercial video games and consoles.	2	1, 4

Computer Usage:
The student game projects will be designed and built using the one of several available embedded or console systems.

Laboratory Projects:
Each student will design and build one or more embedded or console game applications. The project(s) will be documented with a typewritten paper which will include a brief description of the project objectives, design approach, problems encountered, and lessons learned. This will be followed by a detailed and annotated block diagram of the software and any circuits used.

Also, all students will complete 3 or 4 common assignments involving different video, sound generation, and game I/O technologies. These assignments and their representative technologies will be discussed in class.

The course projects will be exhibited at a video game party (the week before final exams) on Friday, December 9, 2011, from Noon through the evening (Last year the party ran from noon until 7 pm.). The video game party will be open to all UNR students and their guests as well as invited guests from local industry and community. Each student will prepare and display a poster presentation for their game project(s). A wide variety of video games will be available for play and pizza and snacks will be provided.

We will meet at the time scheduled for the final examination for graduate student oral presentations and further discussion of all student projects.

Student Participation:
Students are expected to attend all classes and read all of the assigned readings. Often, material will not be covered in both lectures and reading assignments. Thus, both are essential to a full understanding of the course content. Also, completion of homework is essential. Homework will be due as assigned.

Each student must submit project progress reports as defined in the course schedule.

Students are encouraged to study together, but each person must prepare his or her solutions and have a firm understanding of any work turned in. When you put your name on your homework you are stating that it is your own work and not the work of another person. As a reminder of UNR academic standards, please read from the ***UNR on-line Catalog, University Code of Conduct and Policies, POLICIES AND GUIDELINES, ACADEMIC STANDARDS***
http://www.cis.unr.edu/ecatalog/Default.aspx?article_list_id=29351 defining these standards. Specifically, the following: "*Plagiarism is defined as submitting the language, ideas, thoughts or work of another as one's own; or assisting in the act of plagiarism by allowing one's work to be used in this fashion*." This means that if another student asks to borrow your work to copy - JUST SAY NO - or you are participating in plagiarism.

Students enrolled in CPE 681:
1. Graduate students will achieve a deeper understanding of the material presented to the combined group through several course activities including special meetings, a design paper, a research paper, and an oral presentation of their research results.

2. Graduate students are expected to perform at a level which demonstrates active interest and initiative in searching out knowledge of embedded game technology. This means that for each common assignment the graduate students are expected to demonstrate that they have mastered the concepts involve in the assignment. They are also expected to have examined some consequences of the game technology being studied and searched out others' comments on these consequences.

3. Graduate students meet as a group with the course instructor at least once per month for discussion of research methodologies and appropriateness of specific journals and conference proceedings for source material. Further, each graduate student meets individually with the course instructor at least once per month.

4. Graduate students must complete a game project design which involves the synthesis of a game device of their choice which integrates hardware and software to interface human input to an embedded games system. An example of such a project would be the design of modifications needed for a typical game controller which is designed for use with two hands to be effectively used by a person with only one hand.

5. These items 1 through 7 demonstrate the opportunities which graduate students have in this course for work at a higher academic level.

6. Graduate student work will be graded based upon the criteria defined in item 2 above. The assignments must be completed successfully and the student must demonstrate that he or she understands the context within which the assignment material exists in the larger filed of games and human computer interaction.

7. Graduate students are required to complete a research paper which details the evolution of a chosen aspect of video game technology and give an oral presentation of their results to the class. This research paper must include appropriate references from the scientific journals which have presented each step in the development of the technology as it evolved.

For example, the pivotal paper describing the development of computer generated sound is: *The Synthesis of Complex Audio Spectra by Means of Frequency Modulation*, by John M. Chowning, Stanford Artificial Intelligence Laboratory, Stanford, California, J*OURNAL OF THE AUDIO ENGINEERING SOCIETY*, pp 526-534, 1973. The abstract for this paper is included below.

> "A new application of the well-known process of frequency modulation is shown to result in a surprising control of audio spectra. The technique provides a means of great simplicity to control the spectral components and their evolution in time. Such dynamic spectra are diverse in their subjective impressions and include sounds both known and unknown."

The experience gained from preparing the research paper will contribute directly to graduate student capabilities for thesis and dissertation preparation.

Course Grade Structure:
Each course activity will contribute to the course grade as shown below. All activities will be graded on a scale of 0-100 points, and the final course grade will be determined as shown below. All quizzes and exams given in this course will be closed notes and closed books. Only calculators and materials handed out at the time of the exam may be used.

Normally, plus/minus grades are not given in this class. The instructor reserves the right to assign plus/minus grades under special circumstances involving borderline grades based upon class participation. Your grade will never be lower than defined below unless you have not posted weekly progress reports or have an excessive number (3 or more) of un-excused absences from class. However, positive class participation can be used as a basis for raising your grade.

UNDERGRADUATE		GRADUATE	
WebCT Progress Reports	25%	WebCT Progress Reports	20%
Common Assignments	25%	Common Assignments	20%
Student Game Projects	50%	Student Game Projects	25%
		Research Paper	20%
		Design Paper	15%
= COURSE GRADE	100%	= COURSE GRADE	100%

90 - 100 points = A
80 - 89 points = B
65 - 79 points = C
50 - 64 points = D
00 - 49 points = F