

# GAM 374/474: Fundamentals of Game Programming I

Professor Robin Burke

Fall 2013, Section 401/410, CDM 218

Tu/Th 10:10 – 11:40 am

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Office hours: Tu 11:40 – 1:10 pm (Loop) and Tu/Th 4:10 – 5:00 pm (Student Center 332) and by appointment.

Course web site: <http://d2l.depaul.edu/>

## Description

The objective of this course is to learn the fundamental concepts of game programming using C/C++ and OpenGL. Students will learn how to implement simple 3D action games including: 3D rendering operations including texture mapping, physical interactions including collisions, input / output management including game UI, analog controllers, and sound. Emphasis will be placed on the development of the coding skills needed for robust, efficient, and portable implementation.

The classes are interactive lectures with in-class worksheets and group work. There will be three lab sessions.

## Prerequisites

(CSC 393 or (CSC 309 and CSC 301)) and GPH 321

## Course Texts

Shreiner, D. *OpenGL Programming Guide, 7<sup>th</sup> ed. The Official Guide to Learning OpenGL*. Addison-Wesley, ISBN: 978-0-321-55262-4 (recommended)

## Resources

All of our programming will be in C/C++. I will distribute solution files compatible with the Standard or Express Edition (with the Platform SDK) of Microsoft Visual Studio 2010 C/C++. The labs on the 4<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> floor are sufficiently equipped for this course. If you would like to use your own system, it must be running Windows XP/Vista/7, have the above development environment, and a video card and driver that can handle at least an 800x600 32-bit OpenGL 3.1 window.

In addition to Visual Studio 2010, we will make use of the following tools:

- AZUL – an OpenGL-based game engine
- TortoiseSVN -- source control program
- Either
  - Paint.NET – a very simple image editing program, or
  - GIMP – a more sophisticated image editor.
- Audacity – a simple sound editing program

Other custom tools will be provided as necessary.

Student will also need a wired XBOX 360 controller or a wireless controller with PC adapter. Controllers can be borrowed from the Game lab on the 5<sup>th</sup> floor.

## Web Site

The course web site will host copies of handouts, lecture notes, and links to useful resources: <http://d2l.depaul.edu/>. The schedule and other syllabus information may change during the quarter: the web site will contain the most up-to-date information. Grades for assignments will be posted on D2L, but no assignments will be accepted through this site. Assignments must be submitted by SVN commit. See below.

Course discussion will take place using the Piazza system. Post your questions on our class page at: <https://piazza.com/depaul/fall2013/csc270/home>

## Organization and Assessment

GAM 374 will meet twice a week. Class sessions will include lecture, discussion, in-class exercises and activities. Students are expected to attend all classes, do the assigned reading before class time and complete all labs and homework assignments. Undergraduate students will be organized into teams that will work together throughout the quarter and on the final team game. There will also be two exams and three lab sessions.

Grading will be based on accumulated points:

A	2301+	
A-	2151	2300
B+	2001	2150
B	1851	2000
B-	1701	1850
C+	1551	1700
C	1401	1550
C-	1301	1400
D+	1201	1300
D	1101	1200
F	below 1100	

Different elements of the course are worth different numbers of points.

- Participation: Each class attended is worth 15 points, with possible bonuses for insightful or helpful involvement. Bonus points can also be earned for participation in the online forum. Possible points: 225.
- Labs: Each lab completed is worth 25 points. Lab exercises can be completed outside of class time without penalty but are always due one week after the lab session. Possible points: 75
- Quizzes: There are two quizzes, which are open book and open notes. Each is worth 200 points. Distance learning students can request proctored exams via COLWeb. Possible points: 400
- Homework: There are seven homework assignments. They are arranged into tiers. All of the assignments in one tier should be completed before moving on to the next tier. Two of the assignments are “mini-bosses.” If everyone on the team has completed all of the previous tier assignments before the due date for the mini-boss assignment, then everyone on the team receives a 100 point bonus.
  - Tier 0
    - H1: Hello, World (100 points)
  - Tier 1
    - H2: Boxes / Tanks (150)
    - H3: I/O (150)

- Mini-boss
  - H4: Pong (350)
- Tier 2
  - H5: HUD (150)
  - H6: Collisions (150)
- Mini-boss
  - H7: Asteroids (350)
- Team game: The team game is a group project that serves as the final “boss” of the course. Each team will have two students. A student may work solo with the permission of the instructor. As with H4 and H7, if both members of the team has completed their Tier 0, Tier 1 and Tier 2 assignments, then the entire team gets a 100 point bonus for the team game. Each team must also make a presentation of their game at the end of the quarter. (300 [game] + 100 [presentation] = 400 possible points)

## Distance Learning Students

Distance learning students have requirements that are slightly different from in-class students.

- Participation: In lieu of in-class participation, DL students will be expected to complete any in-class worksheets and to post regularly on the course discussion board. Each worksheet completed will be worth 10 points (total of 12) = 120 points. Posts to the course discussion board will be worth from 0 – 15 points, with a maximum of 15 points per week. I will expect at least one post per week. Possible points: 225.
- Labs: Labs are guided homework assignments for DL students rather than completed during class time. Lab sessions will be recorded so that you have the same opportunity to walk through them.
- Teamwork: Like in-class students, DL students will be divided into teams early in the quarter. There will be discussion boards for each team. The final project will also be completed as a team, requiring close coordination, so it is recommended that team members get to know each other in advance. Skype or, if possible, face-to-face discussion outside of class will be important for this part of the class. Mixed DL/in-class teams are not encouraged but will be permitted at student request and the instructor’s discretion.
- Team meetings: I will be scheduling team meetings either in person or via Skype for all game teams including DL teams during Weeks 8 and 9.

## Homework

The most important aspect of the course is the portfolio of homework assignments. This course emphasizes professional standards in coding. Each assignment will have a rubric describing the features required to earn the required points. For example, the rubric for the first “Hello, World” assignment is included below. An assignment that does not meet the minimum requirements listed in the rubric must be resubmitted. Resubmitted assignments can only earn “Basic” credit. Assignments may be submitted up to 1 week late with a 20% penalty. An assignment more than one week late will receive 0 credit and cannot be resubmitted. Assignments can be resubmitted at any time.

To summarize:

- Assignments turned in on time and meeting “Minimum” requirements: score via rubric
- Assignments turned in on time but not meeting “Minimum” requirements: resubmit required
- Assignments more than one week late: 0 points
- Assignments turned in late and meeting “Minimum” requirements: 20% penalty on rubric score
- Resubmitted assignments: Scored only on “Basic” requirements of rubric
- Assignment not resubmitted: 0 points

## Extra Credit

There will be extra credit available for improving certain aspects of the AZUL source code. These opportunities will be announced later in the quarter. Note that extra credit points will only be available if all assignments have been submitted.

## Tentative Class Schedule

9/12: Introduction to the class. Syllabus, organization and assignments. Expectations. Version control.

9/17: OpenGL. OpenGL graphics library: basic concepts and usage. The AZUL game engine.  
Reading: Shreiner, Ch. 1, Ch. 2 through “Basic State Management”

9/19: Data types and multi-platform issues. Writing excellent code. Coding standards for this course: files, functions and blocks, identifiers, and documentation.  
Due: Homework 1: Hello World

9/24: 3D graphics. 3D objects and conventions. Coordinate systems and transformations. Coding / drawing. Drawing and managing 3D objects.  
Reading: Shreiner, Ch. 3 through “Manipulating the Matrix Stacks”

9/26: Input and sounds. Handling buttons and other input devices. The XBox 360 controller . Multi-channel sound. Managing game sounds.  
Due: Homework 2: Boxes and Tanks

10/1: Lab: Debugging.

10/3: Simple game physics. Moving objects. Concepts in collision detection .  
Due: Homework 3: I/O

10/8: Cameras and images. Cameras: Orthographic and perspective views. Loading, drawing and managing images. Quiz 1.

10/10: Texture mapping. Basic concepts of texture application. UV coordinates, rendering operations.  
Due: Homework 4: Pong

10/15: Lab: Texture mapping.

10/17: Collisions I. Collision detection in 3-dimensions. Bounding spheres. Line to plane techniques.  
Due: Homework 5: HUD

10/22: Project planning. Design pitches.

10/24: Collisions II. Responding to collisions. Strategies for dealing with tunneling. Walking / sliding.  
Due: Homework 6: Collisions

10/29: Game logic: Game modes and levels. Organizing and integrating game code.

10/31: First-person games. Camera transformations. Attaching cameras to game objects. Multiple cameras and views.  
Due: Homework 7: Asteroids

11/5: Lab: Maya for AZUL

11/7: Quiz 2 / Team meetings

11/14: Project presentations I

11/19: Project presentations II

11/26: Projects due

## **Course Policies**

### **Attendance**

Students are expected to attend each class and to remain for the duration. Coming 15 minutes late or leaving 15 minutes early constitutes an absence for the student. With an absence, a student loses the 15 participation points for that class.

### **Class Discussion**

Student participation in class discussions will be measured in two ways. First, students are highly encouraged to ask questions and offer comments relevant to the day's topic. Secondly, students will be called upon by the instructor to offer comments related to lecture topics or assignments. Students must keep up with course work to participate in class discussion.

### **Attitude**

A professional and academic attitude is expected throughout this course. Measurable examples of non-academic or unprofessional attitude include but are not limited to: talking to others when the instructor is speaking, mocking another's opinion, cell phones ringing, emailing, texting or using the Internet whether on a phone or computer. If any issues arise a student may be asked to leave the classroom. The professor will work with the Dean of Students Office to navigate such student issues.

### **Civil Discourse**

DePaul University is a community that thrives on open discourse that challenges students, both intellectually and personally, to be socially responsible leaders. It is the expectation that all dialogue in this course is civil and respectful of the dignity of each student. Any instances of disrespect or hostility can jeopardize a student's ability to be successful in the course. The professor will partner with the Dean of Students Office to assist in managing such issues.

### **Cell Phones/On Call**

If you bring a cell phone to class, it must be off or set to a silent mode. Should you need to answer a call during class, students must leave the room in an unobtrusive manner. Out of respect to fellow students and the professor, texting is never allowable in class. If you are required to be on call as part of your job, please advise me at the start of the course.

## **School Policies**

### **Changes to Syllabus**

This syllabus is subject to change as necessary during the quarter. If a change occurs, it will be thoroughly addressed during class, posted under Announcements in D2L and sent via email.

### **Online Course Evaluations**

Instructor and course evaluations provide valuable feedback that can improve teaching and learning. The greater the level of participation, the more useful the results. As students, you are in the unique position to view the instructor over time. Your comments about what works and what doesn't can help faculty build on the elements of the course that are strong and improve those that are weak. Isolated comments from students and instructors' peers may also be helpful, but evaluation results based on high response rates may be statistically reliable (believable). As you experience this course and material, think about how your learning is impacted. Your honest opinions about your experience in and commitment to the course and your learning may help improve some components of the course for the next group of students. Positive comments also show the department chairs and college deans the commitment of instructors to the university and teaching evaluation results are one component used in annual performance reviews (including salary raises and promotion/tenure). The evaluation of the instructor and course provides you an opportunity to make your voice heard on an important issue – the quality of teaching at DePaul. Don't miss this opportunity to provide feedback!

### **Academic Integrity and Plagiarism**

This course will be subject to the academic integrity policy passed by faculty. More information can be found at <http://academicintegrity.depaul.edu/>. The university and school policy on plagiarism can be summarized as follows: Students in this course should be aware of the strong sanctions that can be imposed against someone guilty of plagiarism. If proven, a charge of plagiarism could result in an automatic F in the course and possible expulsion. The strongest of sanctions will be imposed on anyone who submits as his/her own work any assignment which has been prepared by someone else. If you have any questions or doubts about what plagiarism entails be sure to consult the instructor. The bottom line: do all of your own original work and do not copy from fellow students or past assignments.

### **Withdrawal**

Students who withdraw from the course do so by using the Campus Connection system <http://campusconnect.depaul.edu>. Withdrawals processed via this system are effective the day on which they are made. Simply ceasing to attend, or notifying the instructor, or nonpayment of tuition, does not constitute an official withdrawal from class and will result in academic as well as financial penalty.

### **Retroactive Withdrawal**

This policy exists to assist students for whom extenuating circumstances prevented them from meeting the withdrawal deadline. During their college career students may be allowed one medical/personal administrative withdrawal and one college office administrative withdrawal, each for one or more courses in a single term. Repeated requests will not be considered. Submitting an appeal for retroactive withdrawal does not guarantee approval. College office appeals for CDM students must be submitted online via MyCDM. The deadline for submitting appeals for this class is the last day of the last final exam of Winter Quarter 2014.

### **Excused Absence**

In order to petition for an excused absence, students who miss class due to illness or significant personal circumstances should complete the Absence Notification process through the Dean of Students office. The form can be accessed at <http://studentaffairs.depaul.edu/dos/forms.html>. Students must submit supporting documentation alongside the form. The professor reserves the sole right whether to offer an excused absence and/or academic accommodations for an excused absence.

### **Incomplete**

An incomplete grade is a special, temporary grade that may be assigned by an instructor when unforeseeable circumstances prevent a student from completing course requirements by the end of the term and when otherwise the student had a record of satisfactory progress in the course. CDM policy requires the student to initiate the request for incomplete grade before the end of the term in which the course is taken. Prior to submitting the incomplete request, the student must discuss the circumstances with the instructor. Students may initiate the incomplete request process in [MyCDM](#).

- All incomplete requests must be approved by the instructor of the course and a CDM Associate Dean. Only exceptional cases will receive such approval.
- If approved, students are required to complete all remaining course requirement independently in consultation with the instructor by the deadline indicated on the incomplete request form.
- By default, an incomplete grade will automatically change to a grade of F after two quarters have elapsed (excluding summer) unless another grade is recorded by the instructor.
- An incomplete grade does NOT grant the student permission to attend the same course in a future quarter.

### **Students with Disabilities**

Students who feel they may need an accommodation based on the impact of a disability should contact the instructor privately to discuss their specific needs. All discussions will remain confidential.

To ensure that you receive the most appropriate accommodation based on your needs, contact the instructor as early as possible in the quarter (preferably within the first week of class), and make sure that you have contacted the Center for Students with Disabilities (CSD) at: Student Center, LPC, Suite #370 Phone number: (773)325.1677 Fax: (773)325.3720 TTY: (773)325.7296

**Email**

Email is the primary means of communication between faculty and students enrolled in this course outside of class time. Students should be sure their email listed under "demographic information" at <http://campusconnect.depaul.edu/> is correct.

**Quarter at a Glance**

Week	Dates	Reading	Topic	Due
0	9/12,	Ch 1, Ch 2 through "Basic State Management"	Intro to the class.	
1	9/17, 9/19		OpenGL / AZUL. Coding standards, 3D objects and conventions,	
2	9/24, 9/26	Ch. 3 through "Manipulating the Matrix Stacks"	Defining and drawing a world. Input and sounds.	Hello, World
3	10/1, 10/3		Lab: Debugging. Simple physics. Quiz 1	Boxes
4	10/8, 10/10		Bitmapping / icons. Texture mapping.	Diag
5	10/15, 10/17	Ch. 9 through "Texture Objects"	Lab: Texture mapping. Collision I	Pong
6	10/22, 10/24		Design pitches. Collisions II.	HUD
7	10/29, 10/31		Game logic. First-person games.	Collision
8	11/5, 11/7		Lab: Maya for QE. Quiz 2 / Team meetings	Asteroids
9	11/12, 11/14		Team meetings. Presentations I	
10	11/19		Presentations II	
Finals Week	11/26			Project and all assignments

**Other important dates:**

9/24: Last drop day

10/29: Last withdrawal day