CSCE 4220.001
Game Programming 2

Instructors: Curtis Chambers  
Semester: Spring 2021
Office Hours: TBD on Canvas  
Class Time: Mon & Wed 5:30 PM – 6:50 PM
Email: Curtis[dot]Chambers[at]unt[dot]edu  
Location: Remote (Zoom via Canvas)

Course Description:
Game engine programming techniques, including real-time 3D graphics programming, shader techniques, terrain rendering, level of detail, collision detection, particle engines, 3D sound and character animation.

This class will cover 3D game programming with the Unreal Engine 4 (UE4) paired with C++ programming in Visual Studio. Students will have access to the full Unreal source code. Each class meeting will consist of a lecture followed by a hands-on tutorial. Class attendance is mandatory. Grades will be based on the completion of the class tutorial projects, assignments, and a final project.

Learning Outcomes:
By the end of the course, you will have:

1. Knowledge of the basic techniques of 3D game programming.
2. Experience working with a commercial grade game engine.
3. Ability to program a 3D game.
4. Experience with programming using a very large code base.

Prerequisites: CSCE 4210 (Game Programming I) and CSCE 4255 (Programming Math and Physics for Games). Each with a grade of C or better.

Course Requirements:
Attendance: Required.  
Exams: None. A final project will be turned in at the end of the semester.  
Grade: The grade for this class will be based on a sequence of tutorials, assignments, and a project.

Course Topics: (subject to change)

<table>
<thead>
<tr>
<th>Introduction to UE4</th>
<th>Physics Volumes</th>
<th>UE4 Interfaces</th>
<th>HUD and Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Creating a scene</td>
<td>• Post Processing</td>
<td>• Blueprint Contracts</td>
<td>• Adding Dynamic Text</td>
</tr>
<tr>
<td>• Camera Manipulation</td>
<td>• UE4 Sculpting</td>
<td>• Interfaces messaging</td>
<td>• Designing and Implementing Heads-Up Display</td>
</tr>
<tr>
<td>• Insertion of Objects</td>
<td>• Dynamic Physics</td>
<td>• Lighting</td>
<td>• Adding a Character</td>
</tr>
<tr>
<td>• Transform Objects</td>
<td>• Water Meshes and Physics</td>
<td>• Textures</td>
<td>• Designing and Implementing Heads-Up Display</td>
</tr>
<tr>
<td>• Lighting</td>
<td></td>
<td>• UE4 Projects</td>
<td>• Adding a Character</td>
</tr>
<tr>
<td>• Textures</td>
<td></td>
<td>• Blueprints</td>
<td>• Designing and Implementing Heads-Up Display</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UE4 Programming</th>
<th>Physics Volumes</th>
<th>UE4 Interfaces</th>
<th>HUD and Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Adding C++ code to UE4 Projects</td>
<td>• Post Processing</td>
<td>• Blueprint Contracts</td>
<td>• Adding Dynamic Text</td>
</tr>
<tr>
<td>• Blueprints</td>
<td>• UE4 Sculpting</td>
<td>• Interfaces messaging</td>
<td>• Designing and Implementing Heads-Up Display</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Character Setup</th>
<th>Physics Volumes</th>
<th>UE4 Interfaces</th>
<th>HUD and Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Introductory First Person Shooter</td>
<td>• Post Processing</td>
<td>• Blueprint Contracts</td>
<td>• Adding Dynamic Text</td>
</tr>
<tr>
<td>• Animations</td>
<td>• UE4 Sculpting</td>
<td>• Interfaces messaging</td>
<td>• Designing and Implementing Heads-Up Display</td>
</tr>
<tr>
<td>• Player Controls</td>
<td>• Dynamic Physics</td>
<td>• Lighting</td>
<td>• Adding a Character</td>
</tr>
<tr>
<td>• Adding a Character</td>
<td>• Water Meshes and Physics</td>
<td>• Textures</td>
<td>• Designing and Implementing Heads-Up Display</td>
</tr>
</tbody>
</table>
Course Schedule:

Assignments/Tutorials will be due both in class and on Canvas. Pay close attention to the requirements of each assignment as they are administered. Note that there will not be a Spring Break this semester.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Assignments (tentative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/11</td>
<td>Syllabus, Introductions, Class/Homework Assignment Due</td>
</tr>
<tr>
<td>2</td>
<td>1/18</td>
<td>(MLK – No Class) Pitch Week, Project Schedule 1 Due</td>
</tr>
<tr>
<td>3</td>
<td>1/25</td>
<td>Tutorial 1</td>
</tr>
<tr>
<td>4</td>
<td>2/01</td>
<td>Tutorial 2</td>
</tr>
<tr>
<td>5</td>
<td>2/08</td>
<td>Tutorial 3</td>
</tr>
<tr>
<td>6</td>
<td>2/15</td>
<td>Milestone Week 1, Project Schedule 2 Due</td>
</tr>
<tr>
<td>7</td>
<td>2/22</td>
<td>Tutorial 4</td>
</tr>
<tr>
<td>8</td>
<td>3/01</td>
<td>Tutorial 5</td>
</tr>
<tr>
<td>9</td>
<td>3/08</td>
<td>Tutorial 6</td>
</tr>
<tr>
<td>10</td>
<td>3/15</td>
<td>Milestone Week 2, Project Schedule 3 Due</td>
</tr>
<tr>
<td>11</td>
<td>3/22</td>
<td>Tutorial 7</td>
</tr>
<tr>
<td>12</td>
<td>3/29</td>
<td>Tutorial 8</td>
</tr>
<tr>
<td>13</td>
<td>4/05</td>
<td>Tutorial 9</td>
</tr>
<tr>
<td>14</td>
<td>4/12</td>
<td>Project Development and Final Touches Week 1</td>
</tr>
<tr>
<td>15</td>
<td>4/19</td>
<td>Project Development and Final Touches Week 2</td>
</tr>
<tr>
<td>16</td>
<td>4/26</td>
<td>Finals Week, Final Presentation Deadline</td>
</tr>
</tbody>
</table>

Grading Policy:

Grading is, for the majority, binary. In that, you either completed all tasks required on time or you did not. Partial (half) credit is available for most late assignments and tutorials up to 1 week after their due date. Afterwards, no credit will be awarded.

After receiving your grade for an assignment, you have one week to discuss it with me. Afterwards, I will make no changes to the grade. This is to avoid “end of the semester” rush to alter a letter grade bump or penalty that is the result of assignments. Each student should keep track of their grades throughout the semester.

Each assignment will have varying requirements. Pay very close attention to what I am asking you to deliver in every Tutorial, Assignment, and Presentation. Be it on SVN, Canvas, in person, or (in many cases) more than one!

Tutorials

These will instruct and test the student on the UE4 game development environment. Come prepared to class to maximize productivity. Later tutorials require that you have completed and practiced previous tutorials and their relevant content. A list of topics are also provided in the syllabus that you can use to prepare for upcoming topics. Each week I will discuss upcoming topics to help you prepare in advance.

Completing a tutorial on time will earn you full credit. Late tutorials will be accepted up to one week after their due date/time. Late tutorials will earn you half credit.

Assignments
Completing an assignment on time will earn you full credit. Late assignments will be accepted up to one week after their due date/time. Late assignments will earn you half credit. Below is a (tentative) list of expected assignments.

- **UE4 Setup**
  
  During the first week of class, each student will be instructed on how to install UE4 and Visual Studios. There are two parts to this assignment. First, in lecture, each student will be required to follow along installation instructions for the lab computers. Second, each student will perform the installation on a PC or laptop of their choice outside of class. Proof of the installation will be turned in by the due date as required by the instructor. Any student that cannot perform an external install should meet with me immediately as to rectify the situation as soon as we can.

- **Project Schedules**
  
  Throughout the semester, students will be required to keep track of their productivity. Since the final project requires you to work on your game while keeping up with the material in the course, you are to propose and update your project schedule throughout the semester. It is recommended that you perform weekly updates.

  A graded assessment of your schedule will be performed during the Pitch and Milestone weeks. These should reflect the amount of progress you have made (in increments) towards the Final Project. You may be asked to describe, in detail the following:

  - What you have accomplished.
  - What you did not accomplish.
  - What changes you have made to your schedule.
  - What you need to change to meet your deadlines.

  A total of three grades will be assigned to this document. It must be professional and organized. Be prepared to discuss your schedule in detail during class presentations.

  Note: In some cases, I may ask individual students to make immediate adjustments to their schedule to receive full credit. I exercise this option on a student by student basis as to better sustain an environment for learning and improvement. Expect no such option for Milestone 2’s assessment.

- **Project Pitch**
  
  The student will design, create, and present a Pitch for their game that they will turn in at the end of the semester. An assessment of your project schedule will be performed.

- **Project Milestones**
  
  During these weeks, students will demonstrate their progress on their project in class. During Milestone 1, I expect a rough game. By Milestone 2, your game should be nearing completion. Assessments of your project schedules will be performed during each Milestone.

- **Final Project**
  
  At the end of the semester, each student will schedule a 30-minute appointment with me to demonstrate their final project. A schedule will be drawn up towards the end of the semester. What I will be looking for is completeness, playability, and if your project contains things that were not covered in class (techno points). Part of this assignment will require you to submit material online.

  The final project is your final grade. Letter grade bumps or penalties will then be applied towards your final grade for the course.
Your final grade will reflect:

❖ The quality of your game,
❖ The contribution you made to it,
❖ Your performance during presentations (pitch and milestones),
❖ Your final presentation, and
❖ Your performance on the tutorials and assignments.

It is highly recommended that the student dedicates an average of nine productive hours a week (outside of class) on their final project throughout the semester.

• Letter Grade Bump and Penalties:

The total number of graded assignments and tutorials will be added up towards the end of the semester.

❖ Each is worth 1 point. Late assignments are worth half. A student that fully completes all graded submissions on time will receive a letter grade bump (if applicable) at the end of the semester.
❖ For each 5 points missing out of the total (effectively one-third of the total) at the end of the semester, you will be penalized a letter grade.

The max grade bump you can receive is 1. The maximum grade penalties you can receive is 4.

If you do not submit a final project, the highest grade you could receive is a F.

Course Policies:

Academic Misconduct

• The department, college, and university have very strict guidelines regarding academic misconduct. Students are expected to submit their own work on individual programming projects (tutorials, assignments, and final project).
• You are allowed to discuss solutions, but do NOT work with other students on shared program solutions. Do NOT use even partial program solutions from the Internet without properly citing them. Do NOT recycle a complete game, this will result in a failing grade. You may borrow and integrate code from any legal source as long as you properly cite your resources. Failure to do so is considered cheating.
• You will be graded on your contribution to the code. Be honest – attribute your work. Using code without acknowledging it to the instructor is cheating, and will be dealt with in accordance to the department cheating policy.
• If it is determined that you have cheated, the first instance of cheating in the class will result in a grade of ZERO on the assignment in question and referral to the department chairman and dean of engineering. The second instance of cheating in the class will result in a grade of F in the class, and a dismissal hearing may be initiated by the dean of engineering.
• You need to do your own work on your final project as well. Here there should be no ambiguity at all.
• In case the above description, and in-class discussion of my views on appropriate and inappropriate collaboration does not answer all of your questions, please look at the university Student Rights and Responsibilities web page.
• You are responsible for the information covered in class, whether you attend class or not. Individualized lectures will not be given. Please check with other class members for any notes that might have been missed during an absence. Attendance WILL be taken in lecture and your attendance is strongly recommended to improve your opportunity to meet course objectives.
• There will be two Milestones to check-up on the progress of your final project; each with increasing requirements to ensure that you are working on your individual project.
• Progress on your final project should start by the first week of class. The software used is available for home use. With both, you are fully expected to have the ability to work on your project outside of class.
Students who plan to have difficulty with this should meet with me before the end of the second week of classes.

• Each student should adhere to the university’s student code of conduct.

Excused Absences

Students are expected to schedule routine appointments and activities so as not to conflict with attending class. However, some absences cannot be prevented. In the event of a medical emergency or family death, etc., students must request an excused absence as quickly as feasible following the event. Send to me (ASAP) a brief email from your UNT provided email address. You need not go into detail as to the emergency, but you should schedule with me a meeting outside of lecture at your earliest convenience. Students must be able to provide documentation that verifies the reasoning for the excused absence.

Above all else, this course is compliant with UNT Policy 06.039 “Student Attendance and Authorized Absences.” Please refer to this policy for more detail/information.

Emergencies

By definition, emergencies cannot be planned for. Your instructor attempts to make accommodations in these instances that allow for making up missed work and completion of the course in a timely manner. Students must provide documentation that verifies the emergency.

Disability Accommodation

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time, however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information, refer to the

Office of Disability Accommodation website at http://www.unt.edu/oda. You may also contact ODA by phone at (940) 565-4323.

Academic Integrity

Below I have taken out two paragraphs from UNT Policy 06.003 Student Academic Integrity.

“UNT promotes the integrity of learning processed and embraces the core values of trust and honesty. Academic integrity is based on educational principles and procedures that protect the rights of all participants in the educational process and validate the legitimacy of degrees awarded by the university. In the investigation and resolution of allegations of student academic dishonesty, the university’s actions are intended to be corrective, educationally sound, fundamentally fair, and based on reliable evidence.”

“Students are expected to conduct themselves in a manner consistent with the university's status as an institution of higher education. In the class setting, students shall follow their instructors’ directions and observe all academic requirements published in course syllabi and other course materials. A student is responsible for responding to an academic dishonesty report issued by an instructor or other university official. If a student fails to respond after proper attempt at notification, the university may take appropriate academic actions in the absence of the student.”

Academic Freedom and Academic Responsibility

Refer to UNT Policy 06.035
Academic freedom and academic responsibility give vitality to the UNT and its mission. As such, the academic freedom to be able to freely consider or investigate important, and, perhaps, controversial questions is essential to the education of students and advancement of knowledge. Faculty have the academic responsibility to subject their knowledge and postulates to rigorous review by peers who are experts in the relevant subject material, to have a firm foundation of their postulates in the most relevant and suitable available evidence, and to work with one another to provide the best education possible for our students.