CSC 481/591 – Game Engine Foundations

Section 001
FALL 2016
3 Credit Hours

Course Description

The purpose of this course is to familiarize students with issues and techniques of computer games design in general, and more specifically game engine design. With the proliferation of computer games, a number of distinct genres have emerged. Each genre of computer game provides a unique set of design challenges for designers. While there are no "one size fits all" solutions to game design problems, there are a number of techniques common to many different games. These commonalities have given rise to game engines which are software tools to aid designers. Behind almost all successful commercial games are a game engine.

In this course we will examine some of the components of a commercial strength game engine. We will survey different genres of games, using some of the unique design challenges each genre provides as a motivation for an in-depth examination of the affordances games engines provide for designing games of that genre. We will cover topics ranging from data structures, resource management, game loops and logical timing systems, scripting, error logging, and networking.

Students will be given a sequence of multi-week homework assignments, or mini-projects, related to the lecture material. These assignments will require students to implement and/or evaluate some of the algorithms or techniques we are covering during course lectures. Each assignment will build upon previous assignments, and by the end of the course students will have implemented a limited functionality game engine of their own. All students will additionally be evaluated with a midterm and a final exam.

Learning Outcomes

Students will:
1. develop a conceptual framework and vocabulary for computer game engines, their components, and designs as well as an understanding the role of a game engine in the game design process.

2. identify the different game engine systems, how they interact with each other, how they enable the design of various genres of computer games, and how they enable game engine reuse across games and/or game genres.

3. implement various engine systems, and combine them into a functional, simple game engine with sufficient capabilities to support the design of a game.

**Course Structure**

This will be a lecture course covering topics in computer game design and game engine design. Students will be given a sequence of multi-week homework assignments throughout the semester. Additionally, there will be a midterm and a final exam.

**Course Policies**

**Homework:**

Students will submit homework individually unless otherwise specified in the assignment (see the section on "Academic Integrity"). The assignments will either be posted on the course webpage, posted on the course moodle page, or distributed in class. If a student is unable to attend class, it is their responsibility to determine if an assignment was given. Unless otherwise indicated, all assignments will be due by the start of class on the date they are due, and must be submitted using the course moodle page. If assignment due dates fall on days when there is no class meeting, the assignment will be due at the time class meetings typically start.

**Homework Grading:**

Homework submissions will be graded according to the criteria outlined in the assignment. Missing components or lateness will be penalized accordingly.

**Exams:**

This course will have two exams: a midterm and a final. The midterm will be given in class on 10/13/16. The final exam is scheduled from 1:00pm - 4:00pm on 12/13/16. Note, the date of the midterm is subject to change at the discretion of the instructor.
Final Grades and Extra Credit:

At the discretion of the instructor, extra credit opportunities may be offered throughout the semester. The number and value of those opportunities will be solely up to the instructor and will be available to everyone in the course. No individual extra credit opportunities or makeup work will be allowed.

Final grades will be determined by a weighted average of all assignments including late penalties and extra credit. Final grades will not be rounded up or down.

Instructors

Dr David L Roberts (dlrober4) - Instructor
Email: robertsd@csc.ncsu.edu
Web Page: http://www.csc.ncsu.edu/faculty/robertsd/
Phone: 919-513-7182
Office Location: Venture 2, Suite 530, Room 18
Office Hours: Mondays and Tuesdays 1:00pm-2:00pm, and by appointment. Note, the hallway to my office is generally locked, so please call for entry when coming for office hours or for scheduled meetings. You are welcome to stop by my office at any time, but my presence does not necessarily indicate my availability for a meeting.

Debadeep Sen (dsen) - Teaching Assistant
Email: dsen@ncsu.edu
Phone: N/A
Office Location: EB2 1211F
Office Hours: TBD, and by appointment.

Course Meetings

Lecture

Days: T Th
Time: 4:30pm – 5:45pm
Campus: Centennial
Location: EB1 1007
This meeting is required.

Course Materials

Textbooks

Game Engine Architecture - Jason Gregory Edition: 2nd
ISBN: 1568814135
Cost: $55.60
This textbook is optional.

Expenses
Blue books for exams - Approximately $0.50
This expense is required.

Materials
None.

Requisites and Restrictions
Prerequisites
For 481: CSC 316
For 591: None.

Co-requisites
None.

Restrictions
For 481: CSC Majors Only.
For 591: None.

General Education Program (GEP) Information
GEP Category
This course does not fulfill a General Education Program category.

GEP Co-requisites
This course does not fulfill a General Education Program co-requisite.

Transportation
This course will not require students to provide their own transportation. Non-scheduled class time for field trips or out-of-class activities is NOT required for this class.

Safety & Risk Assumptions
None.

Grading
# Grade Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
<th>Details</th>
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<tbody>
<tr>
<td>Homeworks</td>
<td>50</td>
<td>There will be four homework assignments of equal weight (12.5% of your final grade) throughout the semester. Homework assignments will contain 125 points of material. Students enrolled in 481 will be graded out of 100, but may attempt all 125 points if they choose. Students enrolled in 591 will be graded out of 125. All homework assignments will be comprised of code and a writeup. All homework assignments are individual assignments.</td>
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<tr>
<td>Midterm Exam</td>
<td>20</td>
<td>The midterm exam will be given in class on 10/13/16. The date is subject to change at the discretion of the instructor. Any changes will be communicated via in-class announcement and/or via email. All students are required to furnish Blue Books and pens for the exam.</td>
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<tr>
<td>Final Exam</td>
<td>30</td>
<td>The final will be cumulative, and given during the scheduled exam period from 1:00pm - 4:00pm on 12/13/16. All students are required to furnish Blue Books and pens for the exam.</td>
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# Letter Grades

This Course uses Standard NCSU Letter Grading:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score Range</th>
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<tbody>
<tr>
<td>A+</td>
<td>97 ≤</td>
</tr>
<tr>
<td>A</td>
<td>93 ≤</td>
</tr>
<tr>
<td>A-</td>
<td>90 ≤</td>
</tr>
<tr>
<td>B+</td>
<td>87 ≤</td>
</tr>
<tr>
<td>B</td>
<td>83 ≤</td>
</tr>
<tr>
<td>B-</td>
<td>80 ≤</td>
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<tr>
<td>C+</td>
<td>77 ≤</td>
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<tr>
<td>C</td>
<td>73 ≤</td>
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<tr>
<td>C-</td>
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<td>63</td>
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<td>D-</td>
<td>60</td>
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<td>F</td>
<td>0</td>
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Requirements for Credit-Only (S/U) Grading

In order to receive a grade of S, students are required to take all exams and quizzes, complete all assignments, and earn a grade of C- or better. Conversion from letter grading to credit only (S/U) grading is subject to university deadlines. Refer to the Registration and Records calendar for deadlines related to grading. For more details refer to [http://policies.ncsu.edu/regulation/reg-02-20-15](http://policies.ncsu.edu/regulation/reg-02-20-15).

Requirements for Auditors (AU)

Information about and requirements for auditing a course can be found at [http://policies.ncsu.edu/regulation/reg-02-20-04](http://policies.ncsu.edu/regulation/reg-02-20-04).

Policies on Incomplete Grades

If an extended deadline is not authorized by the instructor or department, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at [http://policies.ncsu.edu/regulation/reg-02-50-3](http://policies.ncsu.edu/regulation/reg-02-50-3).

Late Assignments

Unless otherwise requested, completed assignments should be turned in by the beginning of the class period on the date they are due. For assignments for which email or other electronic submission is requested, the submission should be completed before the start of the class period on the date they are due. Every student has four days which they may allocate to late assignments throughout the semester at a cost of five points per day. Once the allotment of four days has been used, there will be no more late submissions accepted. Use of late days is **not** pro rated. For example, a student who submits the first assignment 2 days, 8 hours, and 24 minutes
late will receive 15 points off of their grade, and only has one day remaining for all subsequent assignments.

Valid excuses as determined by the university's attendance policy (http://policies.ncsu.edu/regulation/reg-02-20-03) such as illnesses with a note from a doctor or a death in the family (with documentation) will be granted extensions to deadlines, provided the documentation is presented to the instructor in a timely manner. Other extensions may be granted for other scholarly activities provided arrangements are made with the instructor well in advance of the deadline.

**Attendance Policy**

For complete attendance and excused absence policies, please see http://policies.ncsu.edu/regulation/reg-02-20-03

**Attendance Policy**

Attendance at class sessions is not required; however, absences that are unexcused according to the university's excused absence policy (http://policies.ncsu.edu/regulation/reg-02-20-03) and that result in late assignments or missed announcements may negatively affect students' grades. Documented medical excuses or other excused absences will not adversely affect grades. Conference travel or other scholarly duties discussed well in advance of a missed session may be excused at the discretion of the instructor.

**Absences Policy**

The university's excused absense policy (http://policies.ncsu.edu/regulation/reg-02-20-03) will be used to determine when an absence is considered excused or not.

**Makeup Work Policy**

No makeup work will be given.

**Additional Excuses Policy**

None.

**Academic Integrity**

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Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at http://policies.ncsu.edu/policy/pol-11-35-01

None.

**Academic Honesty**

See http://policies.ncsu.edu/policy/pol-11-35-01 for a detailed explanation of academic honesty.

None.

**Honor Pledge**

Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment." Additionally, by submitting an assignment via moodle you are certifying that you "have neither given nor received unauthorized aid on this test or assignment." It is your responsibility to safeguard your password and limit access to your moodle account.

**Electronically-Hosted Course Components**

Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

**Electronically-hosted Components:** Moodle will be used for supplementary course discussions and for assignment submissions.

**Accommodations for Disabilities**

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, student must register with the Disability Services Office (http://www.ncsu.edu/dso), 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation at http://policies.ncsu.edu/regulation/reg-02-20-01.

**Non-Discrimination Policy**

NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all
employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at http://policies.ncsu.edu/policy/pol-04-25-05 or http://www.ncsu.edu/equal_op/. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

Course Schedule

**NOTE:** The course schedule is subject to change.

**Lecture MW 9:35am - 10:25am — Spring 2014**

**Semester — 01/06/2014 - 04/28/2014**

The schedule is subject to change at the discretion of the instructor. The official schedule will be kept on the course webpage (http://www.csc.ncsu.edu/faculty/robertsd/csc481591f16/schedule.php) and updated periodically to reflect changes as the semester progresses. It is the student’s responsibility to check the schedule regularly for changes. The instructor will communicate any changes in deadlines to students in a timely manner via email and/or announcements in class. Note, it is the student’s responsibility to check their official NCSU email address at least once daily and to come to class. Failure to do so does not excuse missed deadlines.