

CSYE 7270

Building Virtual Environments

Spring 2020 Course Syllabus

Course Information

Professor: Nik Bear Brown
Email: nikbearbrown@gmail.com
Office: 505A Dana Hall
Office hours:
2:00 - 3:30 pm F
12:30 - 2:00 pm M

Course website: Blackboard (for raw scores, uploading assignments, getting materials, & forums)

Piazza:

<https://piazza.com/northeastern/spring2020/csye7270>

Course Prerequisites

A basic knowledge of a programming language is required.

Course Description

This course examines how to program for virtual environments in Unity 3D. Introduces the different subsystems used to create 2D and 3D worlds, including rendering, animation, collision, physics, audio, trigger systems, shading, game logic, behavior trees, and simple artificial intelligence. Offers students an opportunity to learn the inner workings of game and graphics engines and how to use libraries such as physics and graphics libraries to develop virtual environments. Discusses graphics pipeline, scene graph, level design, behavior scripting, object-oriented game design, world editors, and scripting languages. Includes servers and mobile programming (Android and iPhone) will also be introduced.

- There will be weekly assignments creating small games or tools or virtual environments.
- There will be weekly in-class progress presentations.
- There will be a group project and an individual project.

The first half of the class will primarily involve the mechanics of programming for program for games and virtual environments in Unity 3D by building a series of small projects. Students will be given a simple skeleton and then expected to enhance/extend the skeleton for each assignment.

The second half of the class will primarily involve social/network gaming, virtual reality and augmented reality programming.

The class is very interactive so bring a laptop. The first half of the week will be demos and lectures. The second half of the week will consist of students presenting progress and brainstorming. While informal, the brainstorming and progress session is a crucial part of your participation grade (15% of overall grade). This is a VERY HANDS ON class. You will learn by doing.

Learning Objectives

Learning objectives for the course are:

- Learn how to game program C# in a clear, robust, efficient, and safe manner.
- Unity 3D rendering
- Animation
- Unity 3D collisions
- Unity 3D physics
- Unity 3D audio
- Unity 3D trigger systems
- Unity 3D shaders
- Augmented reality
- Virtual reality
- Social/network gaming
- Mobile gaming
- Game servers

Course GitHub

The course GitHub (for all lectures, assignments and projects):

https://github.com/nikbearbrown/CSYE_7270

nikbearbrown YouTube channel

Over the course of the semester I'll be making and putting additional data science and machine learning related video's on my YouTube channel.

<https://www.youtube.com/user/nikbearbrown>

The purpose of these videos is to put additional advanced content as well as supplemental content to provide additional coverage of the material in the course. Suggestions for topics for additional videos are always welcome.

Teaching assistants

The Teaching assistants are:

Rohan Bharti <bharti.r@husky.neu.edu>

Programming questions should first go to the TA's. If they can't answer them then the TA's will forward the questions to the Professor.

Learning Assessment

Achievement of learning outcomes will be assessed and graded through:

- Quizzes
- Exams
- Completion of assignments involving scripting in R or python, and analysis of data
- Completion of a term paper asking and answering a "real world" question of interest using machine learning techniques
- Portfolio piece

Reaching out for help

A student can always reach out for help to the Professor, Nik Bear Brown nikbearbrown@gmail.com. In an online course, it's important that a student reaches out early should he/she run into any issues.

Grading Policies

Students are evaluated based on their performance on assignments, performance on exams, and both the execution and presentation of a final project. If a particular grade is required in this class to satisfy any external criteria—including, but not limited to, employment opportunities, visa maintenance, scholarships, and financial aid—it is the student's responsibility to earn that grade by working consistently throughout the semester. Grades will not be changed based on student need, nor will extra credit opportunities be provided to an individual student without being made available to the entire class.

Grading Rubric

The following breakdown will be used for determining the final course grade:

Assignment	Percent of Total Grade
Assignments	30%
Mid-term Project	10%
Final Project	15%
Participation	15%
Portfolio	5%
Quizzes (In class)	10%
Exams (In class)	15%

* Note that the assignments, presentations and drafts related to the research project go to that score rather than the programming assignments. I expect to use the following grading scale at the end of the semester. You should not expect a curve to be applied; but I reserve the right to use one.

Score	Grade
93 – 100	A
90 – 92	A-
88 – 89	B+
83 – 87	B
80 – 82	B-
78 – 79	C+
73 – 77	C
70 – 72	C-
60 – 69	D
<60	F

Scores in-between grades. For example, 82.5 or 92.3 will be decided based on the exams.

* Note the score is calculated using the grading rubric and IS NOT the average of the assignments that is displayed by BlackBoard.

Blackboard

You will submit your assignments via Blackboard and Github. Click the title of assignment (blackboard -> assignment -> <Title of Assignment>), to go to the submission page. You will know your score on an assignment, project or test via BlackBoard. BlackBoard only represents only the raw scores. Not normalized or curved grades. A jupyter notebook file ALONG with either a .DOC or .PDF rendering of that jupyter notebook file must be submitted with each assignment.

Multiple files must be zipped. No .RAR, .bz, .7z or other extensions.

Assignment file names MUST start with students last name then first name OR the groups name and include the class number and assignment number.

Assignment MUST estimate the percentage of code written by the student and that which came from external sources.

Assignment MUST specify a license at the bottom of each notebook turned in.

All code must adhere to a style guide and state which guide was used.

Due dates

Due dates for assignments at midnight on due date of the assignment.

Five percent (i.e. 5%) is deducted for each day an assignment is late. Solutions will be posted the following Monday. Assignments will receive NO CREDIT if submitted after the solutions are posted. Any extensions MUST be granted via e-mail and with a specific new due date.

Course Materials

The textbooks are all available for free to NEU students via SpringerLink (<http://link.springer.com/>). the required textbooks we will be using in this class are:

Developing 2D Games with Unity

Independent Game Programming with C#

Authors (view affiliations)

Jared Halpern

SpringerLink: <https://link.springer.com/book/10.1007/978-1-4842-3772-4>

Make a 2D Arcade Game in a Weekend

With Unity

Authors

Jodessiah Sumpter

SpringerLink: <https://link.springer.com/book/10.1007/978-1-4842-1494-7>

Beginning 3D Game Development with Unity 4:

All-in-One, Multi-Platform Game Development

Authors

Sue Blackman

SpringerLink: <https://link.springer.com/book/10.1007/978-1-4302-4900-9>

Recommended books (free to NEU students via SpringerLink):

Beginning 3D Game Development with Unity: All-in-One, Multi-Platform Game Development

Author: Sue Blackman, *Apress* 2013

ISBN: 9781430248996

SpringerLink: <http://link.springer.com/book/10.1007/978-1-4302-4900-9>

Learn Unity 4 for iOS Game Development

Author: Philip Chu, *Apress* 2013

ISBN: 9781430248767

SpringerLink: <http://link.springer.com/book/10.1007/978-1-4302-4876-7>

Learn Unity for 2D Game Development

Author: Alan Thorn, *Apress* 2013

ISBN: 9781430262305

SpringerLink: <http://link.springer.com/book/10.1007/978-1-4302-6230-5>

Beginning C# Object-Oriented Programming

Authors: Dan Clark, *Apress* 2013

ISBN: 978-1-4302-4935-1 (Print) 978-1-4302-4936-8 (Online)

SpringerLink: <http://link.springer.com/book/10.1007/978-1-4302-4936-8>

C# Quick Syntax Reference

Authors: Mikael Olsson, *Apress* 2013

ISBN: 978-1-4302-6280-0 (Print) 978-1-4302-6281-7 (Online)

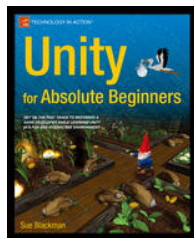
SpringerLink: <http://link.springer.com/book/10.1007/978-1-4302-6281-7>

Learning C# by Programming Games

Authors: Arjan Egges, Jeroen D. Fokker, Mark H. Overmars, *Springer* 2013

ISBN: 978-3-642-36579-9 (Print) 978-3-642-36580-5 (Online)

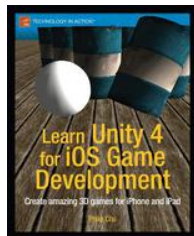
SpringerLink: <http://link.springer.com/book/10.1007/978-3-642-36580-5>



Unity for Absolute Beginners

Sue Blackman (2014)

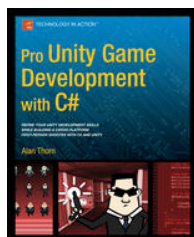
1. Book
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Learn Unity 4 for iOS Game Development

Philip Chu (2013)

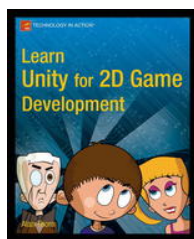
2. Book
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Pro Unity Game Development with C#

Alan Thorn (2014)

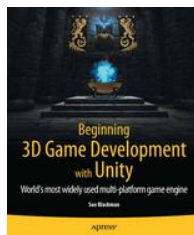
3. Book



Learn Unity for 2D Game Development

Alan Thorn (2013)

4. Book



Beginning 3D Game Development with Unity

The World's Most Widely Used Multi-platform Game Engine

Sue Blackman (2011)

5. Book

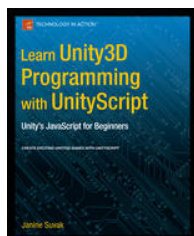


Beginning 3D Game Development with Unity 4:

All-in-One, Multi-Platform Game Development

Sue Blackman (2013)

6. Book



Learn Unity 3D Programming with UnityScript

Hardware:

You must have access to a computer that runs Unity 3D. If you don't have a laptop or home computer that can run Unity 3D. If you don't have this then contact me, and we'll set you up with an account in the game lab.

Mobile device - You must have access to a mobile device (iPhone/iPad/Android) around week nine of the course. The mobile device need not have a working phone number; just the accelerometer and touch pad functionality for testing a port of a game to a mobile device. If you don't have this then contact me and we'll partner you with somebody with a mobile device.

Software:

Unity 3D (<http://unity3d.com/unity/download>)

Houdini Engine for Unity (<http://www.sidefx.com/unity>)

Participation Policy

Participation in discussions is an important aspect on the class. It is important that both students and instructional staff help foster an environment in which students feel safe asking questions, posing their opinions, and sharing their work for critique. If at any time you feel this environment is being threatened—by other students, the TA, or the professor—speak up and make your concerns heard. If you feel uncomfortable broaching this topic with the professor, you should feel free to voice your concerns to the Dean's office.

Collaboration Policies

Students are strongly encouraged to collaborate through discussing strategies for completing assignments, talking about the readings before class, and studying for the exams. However, all work that you turn in to me with your name on it must be in your own words or coded in your own style. Directly copied code or text from any other source MUST be cited. In any case, you must write up your solutions, in your own words. Furthermore, if you did collaborate on any problem, you must clearly list all of the collaborators in your submission. Handing in the same work for more than one course without explicit permission is forbidden.

Feel free to discuss general strategies, but any written work or code should be your own, in your own words/style. If you have collaborated on ideas leading up to the final solution, give each other credit on what you turn in, clearly labeling who contributed what ideas. Individuals should be able to explain the function of every aspect of group-produced work. Not understanding what plagiarism is does not constitute an excuse for committing it. You should familiarize yourself with the University's policies on academic dishonesty at the beginning of the semester. If you have any doubts whatsoever about whether you are breaking the rules – ask!

Any submitted work violating the collaboration policies WILL BE GIVEN A ZERO even if “by mistake.” Multiple mistakes *will be sent to OSCCR for disciplinary review.*

To reiterate: **plagiarism and cheating are strictly forbidden. No excuses, no exceptions.** *All incidents of plagiarism and cheating will be sent to OSCCR for disciplinary review.*

Assignment Late Policy

Assignments are due by 11:59pm on the due date marked on the schedule. Late assignments will receive a 5% deduction per day that they are late, including weekend days. It is your responsibility to determine whether or not it is worth spending the extra time on an assignment vs. turning in incomplete work for partial credit without penalty. Any exceptions to this policy (e.g. long-term illness or family emergencies) must be approved by the professor.

Five percent (i.e. 5%) is deducted for each day an assignment is late. Assignments will receive NO CREDIT if submitted after the solutions are posted. Any extensions MUST be granted via e-mail and with a specific new due date.

Only ONE extension will be granted per semester.

Student Resources

Special Accommodations/ADA: In accordance with the Americans with Disabilities Act (ADA 1990), Northeastern University seeks to provide equal access to its programs, services, and activities. If you will need accommodations in this class, please contact the Disability Resource Center (www.northeastern.edu/drc/) *as soon as possible* to make appropriate arrangements, and please provide the course instructors with any necessary documentation. The University requires that you provide documentation of your disabilities to the DRC so that they may identify what accommodations are required, and arrange with the instructor to provide those on your behalf, as needed.

Academic Integrity: All students must adhere to the university’s Academic Integrity Policy, which can be found on the website of the Office of Student Conduct and Conflict Resolution (OSCCR), at <http://www.northeastern.edu/osccr/academicintegrity/index.html>. Please be particularly aware of the policy regarding plagiarism. As you probably know, plagiarism involves *representing anyone else’s words or ideas as your own*. It doesn’t matter where you got these ideas—from a book, on the web, from a fellow-student, from your mother. It doesn’t matter whether you quote the source directly or paraphrase it; if you are not the originator of the words or ideas, *you must state clearly and specifically where they came from*. Please consult an instructor if you have any confusion or concerns when preparing any of the assignments so that together. You can also consult the guide “Avoiding Plagiarism” on the NU Library Website at http://www.lib.neu.edu/online_research/help/avoiding_plagiarism/. If an academic integrity concern arises, one of the instructors will speak with you about it; if the discussion does not resolve the concern, we will refer the matter to OSCCR.

Writing Center: The Northeastern University Writing Center, housed in the Department of English within the College of Social Sciences and Humanities, is open to any member of the Northeastern community and exists to help any level writer, from any academic discipline, become a better writer. You can book face-to-face, online, or same day appointments in two locations: 412 Holmes Hall and 136 Snell Library (behind Argo Tea). For more information or to book an appointment, please visit <http://www.northeastern.edu/writingcenter/>.