COURSE TITLE:	**AI For Games**
COURSE NUMBER:	CAT 328
INSTRUCTOR:	Kristofer Schlachter
DATES:	1/26/10 to 5/11/10
Where And When:	Talbott 203 Tuesdays 6PM-9:40PM

Course Blog: http://www.blackicegamesnyc.com/blog/

COURSE DESCRIPTION: This course will cover basic game AI techniques. The techniques will be demonstrated in class and the students will code their own versions in class and in assignments..

COURSE OBJECTIVES: At the conclusion of this course, you will be able to:
- Be able to use a real game engine, Unity, that is widely used in the industry.
- Create and deploy games created in Unity.
- Implement various AI techniques in Unity using one of the supported programming languages.

PREREQUISITES: Know how to program in either Javascript/Actionscript or a modern object oriented programming language (such as C++, java, C#, python). Familiarity or willingness to learn some basic 3D graphics, math concepts, basic Graph construction and searching and tree traversal.

RESOURCES	DESCRIPTION OF CONTENT	REQUIRED	OPTIONAL
TEXTBOOK	Artificial Intelligence for Games, 2nd Edition by Ian Millington and John Funge	XX	
RESOURCES & SUPPLIES	A binder or notebook for class notes with pockets or a secure folder for handouts.	X	
	Access to a computer with Internet connectivity, and Unity3D 2.6 or higher installed.	XX	
	A working BC email and Blackoard account	XX	

Skills DEVELOPED: AI Techniques: A bunch of AI techniques will be taught starting with simple methods and gradually introducing more complicated algorithms. There will be simple reactive methods that are stateless and require no planning (Steering behaviors). There will be reactive but state based(State Machines) methods and then there will be state based planning(Path Finding A*) and decision making methods (Decision Trees and Behavior Trees).

Programming Techniques: Because the assignments in the class are to make games the class will learn game programming techniques. They will learn how to handle user input, move objects in a 3D environment, use a physics engine and deal with collisions and anything else they need to

complete the game idea they choose to implement.

3D Math: Because almost all AI for Games techniques use Matrices and Vectors the students will become competent at using and understanding 2D and 3D vectors and Matrices. They wont need to know multivariable calculus or linear algebra to be able to grasp what is necessary to implement the techniques but they will learn what the significance of adding and subtracting vectors, using dot products and how Transformation (Affine) matrices effect vectors when they are multiplied.

Data Structures and Algorithms. Students will learn about trees and Graphs. They will learn how to turn a 3D world into a Graph that can then be searched to find a valid path from one point to another.

INSTRUCTIONAL METHODS:	Lectures, required readings, and group and online discussions. While based on the standard pedagogical method of teaching, and featuring regular lectures on industry topics, this class will heavily emphasize coding games during class and for assignments.
GRADING:	100% projects. The number of projects depends on how far the class gets into the desired list of topics. Each project will be equally weighted with the worst grade being dropped before averaging. So if there are 10 projects each student will have lowest graded project dropped and the average of the top 9 will be their final grade.

There will be extra credit features in each project which will allow students to get a grade of higher than 100% on an project. |
ON-LINE & IN-CLASS DISCUSSIONS:	Each online discussion question will have an expiration date after which no more comments will be accepted. You are expected to utilize industry-specific vocabulary to create discussions of high quality that reflect the knowledge you have gained in class. These comments should be reflective, insightful, and "meaningful".
ON-LINE NETIQUETTE:	When posting on the discussion board or when sending an email, you are expected to: • Be respectful. • Use acceptable grammar and spelling. (Take advantage of Spell Check!) • Use colors and fonts that are easily readable. • Use sentence case. Email or discussion posts that appear in all UPPERCASE are inappropriate. It can be perceived that the writer is shouting. Instead, format your text with italics or bold for emphasis. • Keep communication on the discussion boards relevant to the topic. • Converse in the same manner in which you would if this were an in class meeting. Harassment will not be tolerated. For a more complete definition of what the College considers harassment, consult the Student Policies and Resources Handbook. • Give constructive feedback when critiquing a colleague's work. It is more productive to offer meaningful feedback so that person can learn and do better the next time.
GROUP EXPECTATIONS:	A goal of this class is to mirror how collaborative creative teams function in the games industry. To accomplish this, some of the work of this class will be done in groups to which you will be assigned. As a member of a group, the following apply: • You are expected to significantly contribute to the work of the group. • You are expected to work together with your fellow group members, not separately,

to submit an assignment that meets your agreed-upon standards of excellence.

- You must review the final product that is submitted by the group to ensure you are satisfied with that product. If you do not review the product you are still responsible for its content.
- You will receive a grade for the group's product regardless of your approval or individual contribution.
- It is up to you to make sure each member of the group deserves the grade received. This means that you are all responsible to make sure each member participates and makes a significant contribution.
- You will be responsible for evaluating each member's contribution to the group assignments at the end of the semester.
- The instructor reserves the right to adjust any individual group member's grade for any assignment based on the feedback by the rest of the group members at the end of the semester. In other words, free-riders will not be tolerated or rewarded!

OFFICE HOURS: I am available from 5-6PM on Tuesdays (Right before class) the location is TBD.

CONTACT INFORMATION: Work Phone: 917-232-7192 *(email me! – I don't check voicemail every day)*
Email Address: kris@gothamwavegames.com
Website: http://www.blackicegamesnyc.com/blog/

COURSE Topics:

1 Software Tools
Asses class programming skill
Teach Unity3D
Go through editor tutorial
Show prefabs
Events
Triggers
Character controllers
Rigid bodies.
Asset Bundles
Publishing

Projects:
Walking in a field/Nature Exploration/Find and trigger something(Scavenger Hunt)

2 Math
Normalization – What is it?
Unity Math Classes
Vectors: Add, Subtract, Dot Product, Cross Product,Projection
Matrices: Rotate,Translate, WorldTransform, LocalTransform
Splines: Catmull Rom,Bezier
Graphs
Trees
Paths

Projects
Fish Tank.
Artillery Game

3 Steering Behaviors (Reactive AI)
3.1Basics:
Seek

Flee
Face/Align
Arrival

Porjects:
Safari
Koi Pond

3.2 Intermediate Steering Behaviors:
Simple path follow
Obstacle Avoidance
Unaligned Collision Avoidance
Containment Wall Follow.

Projects:
Racing or driving
Ants
Crowd simulation

3.3 Advanced Steering Behaviors:
Formations
Flocking
Swarming

Projects
Tank combat
Swarm of bees
Fish schooling
Herding animals
Safari

3.4 Most Advanced Steering Behavior
Path following

4 State Machines
Simple State Machines
State Transitions

Projects
Zombies
Guards
Animal AI in Safari

5. Path Planning
5.1 Basic Path Planning
World Representation Techniques
        Grid
        Navigation Mesh

5.2 Graph Search Algorithms
Breadth First Search
Depth First Search
A- Star
Cleaning up A-Star

Projects:
Tower Defense
FPS

5.3 Tactical Path Planning (Optional)

6. Decision Trees
Basics
Random Trees
Replace State Machines

7 Behavior Trees(optional)
examples
experiment

COURSE POLICIES:

ATTENDANCE:	Role will be taken at the beginning of every class. If you are unable to attend you are required to notify me before class with an email. Attendance at scheduled class meetings is mandatory. Excessive tardiness, leaving early, and any unexcused absences will be documented. Arriving late or leaving class early will count for an absence after 2 occurrences. In recognition that there may be factors which prevent attendance (illness & family emergencies), students are permitted a limited number of absences not to exceed two weeks of class meetings (4 classes). Exceeding this allowance will result in a grade of W up until the last date of withdrawal without permission, or a grade of WF after that date. A student may attend class for two weeks following a withdrawal while the withdrawal is being appealed. Appeals should be directed to the division chair. *(Attendance is covered in detail in the student handbook.)*
BLACKBOARD:	**http://130.156.24.77/** Blackboard is a crucial tool for communication in this class. Not only will we be using it for discussions, but I will also post weekly assignments, links, directions, extra credit opportunities, and other important information on the Blackboard class pages. There may also be regular emails going out to all students utilizing the Blackboard email services. This utilizes your college email address, so you should be in the habit of checking it daily for class and college information. You should be on Blackboard and checking your Bloomfield College email address DAILY. *(Yes, seriously, check both daily for college information and course announcements!)*
LATE WORK:	All assignments are due on the day and time stated in class and in Blackboard. A very small grace period will be given for Blackboard-based assignments, as I know that Blackboard is not up and 100% available all the time. Assignments will be docked 15% per week that they are late. I will not accept work more than 2 weeks late.
PLAGIARISM:	Students are expected to do their own work. If you take a quote or piece of writing from another source, remember to acknowledge the original writer as the creator. **– See Appendix A –** *(Plagiarism is covered in detail in the student handbook)*

NOTE: **The syllabus is at the discretion of the instructor. If changes are made you will be notified and Blackboard will be updated with the new syllabus.**

REVISION DATE: 1/26/10

Bloomfield College will make reasonable accommodations for persons with *documented* disabilities. Students are encouraged to contact Disabilities Services (x654) for information. As your instructor, I am happy to discuss specific needs with you as well.

APPENDIX A
Plagiarism: What You Should Know About It

Bloomfield College Policy on Plagiarism:
Plagiarism is the copying of a passage or idea from a book, article, notebook, laboratory report, video, internet, or other source, published or unpublished, without acknowledging the source of the passage or idea. Text extracted from another source without substantial paraphrasing must be cited as a quotation, or it, too, will be considered plagiarism. Finally, any replication of a student's own work from prior semesters or other courses will be considered as plagiarism, unless the instructor's approval for such usage has been obtained. Penalties for plagiarism can include a written warning/reprimand and a combination of one or more of the following:
- Redoing the assignment
- Obtaining a failing grade for the assignment
- Obtaining a failing grade in the course
- Suspension or expulsion from the college

How can you avoid plagiarism?
1. Organize your research so you know when you are noting the exact language from a source. This way, you can be sure of citing it as such in your paper.
2. Make sure to record all information necessary to completely cite any source, both in the text and in the Works Cited list.
3. When you paraphrase a source (put it in your own words), make sure the words you use convey the same meaning, but use a different vocabulary.
4. Do NOT, under any circumstances, copy something from the internet and insert it into your own paper without citing it properly.
5. Do NOT use another student's work without acknowledging the source under any circumstances.

THE HONEST AND APPROPRIATE USE OF SOURCES IS THE HALLMARK OF THE COMPETENT SCHOLAR.