Syllabus

Course Description:

**ECSE-4750 Computer Graphics**

Introduction to Interactive Computer Graphics, with an emphasis on applications programming. Objects and viewers, and the synthetic camera model. Graphics architectures, the graphics pipeline, clipping, rasterization, and programmable shaders. Input and interaction. Geometric objects, homogeneous coordinates, and transformations. Viewing, hidden surface removal, frame and depth buffers, compositing, and anti-aliasing. Shading, light and materials, texture mapping, ray tracing, and radiosity. Intellectual property concerns. Extensive programming with the OpenGL API. Prerequisite: ECSE-2610 Computer Components & Operations, or ''CSCI-2500 Computer Organization, or equivalent. Fall term annually. 3 credit hours''

**Why take this course:**

The massive data sets being produced by cheap sensors are useless unless they can be understood by people. Complicated machines are useless unless they can be easily controlled. This course will help you do both. The key is graphics and visualization. We don't just teach useful platform-independent tools. We also teach the underlying math and algorithms used by all tools so that you can design better tools.

**Why not to take this course:**

Since you're spending a lot of money to take this course, you need to know some keys to success (or the alternative). Here are some indications that other courses might be a better fit.

You don't like programming.

You don't like documenting your programs.

You don't like math.

You don't like reading.

**Prerequisites:**

This is a senior CSYS course, and assumes a moderate computer maturity, represented in the catalog by either listed prereq. If you don't have either specific course, talk to me.

You also must know some high level language, such as C++, sufficient to learn Javascript. One of many good online tutorials is [W3Schools JavaScript Tutorial](http://www.w3schools.com/js/).

Computer Graphics also assumes that you know, or be able to learn, some basic linear algebra, up to the level of what an eigenvalue is.

**Instructors:**

Thomas Citriniti, MS RPI ‘97

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| Office | Online hours by appointment, please schedule with me. |
| Phone | +1 (518) 387-9866 (Please leave a message.) |
| Email | mailto: citrit@rpi.com |
| Web | http:// |
| Office hours | After each lecture, usually as long as anyone wants to talk. Also by appointment. |
| Informal meetings | We can meet as needed. |
| Preferred | Email. |

**TA:**

Name: Yu Chen  
Contact info: [cheny39@rpi.edu](mailto:cheny39@rpi.edu" \t "_blank)  
Office hours: AE 217 Wed 6-7 and by email.

**Background**

I am a Principal Architect in the Software Sciences and Analytics organization at GE Global Research in Niskayuna. I lead teams that architect and build large scale systems for GE research projects for businesses and externals.

I have been programming computers for a long time. My first program was a fortran project in which we submitted punch cards with our code. I am very happy that technology has advanced enough so that instead of dropping my program and scrambling it, the software I am using crashes while I am typing and I loose all my changes (usually 2-3 hours worth). Actually very little has changed.

**Schedule:**

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| Date | Description |
| Sept 1 | No Class, Tom is in India. |
| Sept 8 | Intro and computer graphics overview and where we are going. |
| Sept 15 | Intro to core CG algorithms |
| Sept 22 | Padraic Hennessy from Vicarious Visions and Graphics |
| Sept 29 | WebGL overview and programing - Functional |
| Oct 6 | Graphics programing and OO constructs. (Simple Draw paradigm) |
| Oct 13 | No class, Monday Schedule |
| Oct 20 | Mid-term Exam |
| Oct 27 | Midterm review, Scene graphs and WebGL |
| Nov 3 | Peter Tu and Computer Vision |
| Nov 10 | Object Oriented graphics materials and lights. |
| Nov 17 | No Class |
| Nov 24 | VTK Presentation |
| Dec 1 | Real computer graphics systems Vtk |
| Dec 8 | The future of computer graphics |

**Meeting Times and Places**

Tues 6-9 pm., LOW 4030

Lectures

**Attendance Policy**

Please make every attempt to make class. I usually explain things much more in class. If there is a topic you are not comfortable with please make that class. I also make questions on exams reflect what was discussed in class so if you choose not to attend please make sure you contact someone with good notes.

**Lecture Notes**

I plan to prepare and lecture from web pages.

I may even update them in class in response to your questions.

After class, I'll post the updated pages on the public webserver for you to read and copy.

**Important Dates**

Here is a summary of important dates so far.

Midterm exam on Tuesday Oct 20. Grades before the drop date, Oct 23.

There will be a term project at the end, work in groups of 4 or less.

**Handouts**

There will be few handouts since most things will be on the web.

**Textbook**

**Interactive Computer Graphics: A Top-Down Approach with WebGL, Seventh Edition**, Edward Angel; Dave Shreiner. From [http://www.coursesmart.com/IR/1407631/9780133575378?\_\_hdv=6.8](http://www.coursesmart.com/IR/1407631/9780133575378?__hdv=6.8" \t "_blank).

This is the [Amazon site](http://www.amazon.com/Interactive-Computer-Graphics-WebGL-7th/dp/0133574849/ref=la_B001IOF5SE_1_2?s=books&ie=UTF8&qid=1399928374&sr=1-2" \t "_blank).

This is the [textbook author's site](http://www.cs.unm.edu/~angel/" \t "_blank).

I made the change because the new book covers WebGL, which is more portable, and because it has better supplementary material. Also, this book is widely used by other colleges. The tradeoff is that it is more expensive, which is unfortunate.

**Term Project due last class.**

You will think of, implement, and document a program relating to graphics. It must demonstrate both graphics input and output; other than that it must only be legal and ethical.

This may be done by a team, and may be combined with another course's project if you get the approval of everyone involved.

It may build on previous work, either by you or someone else, with their permission, provided that you mention this. Since in the real world, much more money is spent modifying existing software than writing new software, extending an existing program is quite ok with me.

The penalty for handing the project in late will be 10% per day. Plan to have it actually ready earlier in case your disk crashes or account expires. You may pick up your projects after they are graded.

Up to half the grade may be on the documentation and examples.

**Grading:**

The relative weights of the different grade components are as follows.

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| --- | --- |
| Component | Weight |
| Homework | 25% |
| Midterm exam | 25% |
| Term project | 40% |
| Class Participation | 10% |

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| --- | --- |
| Percentage grade | Letter grade |
| >=95.0% | A |
| >=90.0% | A- |
| >=85.0% | B+ |
| >=80.0% | B |
| >=75.0% | B- |
| >=70.0% | C+ |
| >=65.0% | C |
| >=60.0% | C- |
| >=55.0% | D+ |
| >=50.0% | D |
| >=0% | F |
|  |  |

Subject to change based on class averages.

Late homework with be penalized 2 points for each day late

**Academic integrity**

1. See the Student Handbook for the general policy. The summary is that students and faculty have to trust each other. After you graduate, your most important possession will be your reputation.

Specifics for this course are as follows.

1. You may collaborate on homeworks, but each team of 1 or 2 people must write up the solution separately (one writeup per team) using their own words. We willingly give hints to anyone who asks.
2. The penalty for two teams handing in identical work is a zero for both.
3. You may get help from anyone for the term project. You may build on a previous project, either your own or someone else's. However you must describe and acknowledge any other work you use, and have the other person's permission, which may be implicit. E.g., my web site gives a blanket permission to use it for nonprofit research or teaching. You must add something creative to the previous work. You must write up the project on your own.
4. However, writing assistance from the Writing Center and similar sources in allowed, if you acknowledge it.
5. The penalty for plagiarism is a zero grade.
6. You must not communicate with other people or machines, exchange notes, or use electronic aids like computers and PDAs during exams.
7. The penalty is a zero grade on the exam.
8. Cheating will be reported to the Dean of Students Office.