# CPSC310A Computer Graphics

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Instructor: Dr. Stephen Hughes

Time: Block 7a; MW, 2:20 - 3:50 pm

Place: Trexler 363

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**Course Overview**

"The purpose of computing is insight, not numbers" ~Roger Hamming

Hamming was not referring specifically to visual presentation of data, yet students of Information Visualization will invariably encounter this quote – usually after reading less than a half-dozen papers. However, since visualizations intuitively provide insight, nobody questions the suitability of this citation. This intuition is so strong that people also readily credit the saying, "a picture is worth a thousand words" as an ancient Chinese saying, attaching the connotation of enhanced wisdom. In fact, this statement orignated as an advertising principle in the 1920's. Vision and comprehension of information are indelibly linked in our culture and language. To indicate understanding, we say "I see", getting at the details, we "bring it into focus", and removing ambiguities makes the data "clear" (Card, et.al 1999).

Computer graphics studies the presentation of imagery that is generated and manipulated through computation, and is a critical technology to dissemenation of knowledge. In previous years, the inclusion of a simple bar graph in a publication added an inordinate expense – both in the time to initially produce and the difficulty of embedding it within a document. With today's technology, the same chart can be created and reproduced almost instantaneously. Advances in computer graphics mean that more complex displays can be produced and reproduced with minimal effort. This means that graphics no longer need to be static snapshots of the data, but can become interactive. Viewers can formulate, explore and validate hypotheses about the data, opening a whole new dimension of insight and understanding.

This course is designed to provide an overview of the fundemental principles of interactive computer graphics from which many commercial packages are derived. These issues will be explored through the lens of a state-of-the art graphics API: OpenGL. We will also look at the some of the macro-issues associated with graphics, such as Visualization, Virtual Reality, and Image Processing to better understand where this knowledge can be applied.

**Course Content**

The following is a ***tentative*** outline of the class

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| Jan 16 | Visualization –the why of Computer Graphics |
| Jan 23 | Graphic Systems, Color, Scan Conversion |
| Jan 30 | Drawing Effects, Glut overview. Interaction Tricks |
| Feb 6 | Transformations & Animation Basics |
| Feb 13 | Clipping |
| Feb 20 | **Midterm** ,Virtual Reality, Augmented Reality |
| Feb 27 | 3D Modelling |
| Mar 6 | Spring Break |
| Mar 13 | 3D Viewing,Camera Interaction |
| Mar 20 | Lighting |
| Mar 27 | Shading & Spotlights |
| Apr 3 | Shadows |
| Apr 10 | Textures |
| Apr 17 | Image Processing/ Computer Vision |
| May 2 | Final Exam 2:00 – 5:00 |

## Course Materials

Textbook: There is no textbook required for the course, however, it would be a good idea to get a reference manual for OpenGL. There are a lot of tutorials on the web, and you may find those sufficient. If you want a physical book I would recommend:

- Angel. ***OpenGl: A Primer*** ISBN 0-321-23762-5
  - This is a good starting point and will get you through the course. Cost ~$22

- Shreiner, Woo Neider, and Davis. ***Open GL Programming Guide*** ISBN 0-321-33573-2
  - This is ***"the"*** reference and worth having if you expect to do much in graphics beyond the course. Cost ~$60.

## Grading

**50%** **Assignments** There will be roughly 10 assignments. Most of these will involve some programming. Aesthetics will generally not be factored into your grade; I am not an artist either.

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| **20%** | **Midterm** | There will be a midterm (circa Feb 20) |
| **25%** | **Final Exam** | May 2. The final exam will be cumulative |
| **5%** | **MCSP Conversations** | The Math, Computer Science and Physics department offers a series of discussions that appeal to a broad range of interests related to these fields of study. These co-curricular sessions will engage the community to think about ongoing research, novel applications and other issues that face our discipline.<br><br>You are invited be involved with all of these meetings; however, participation in at least two of these sessions is mandatory. For each of the required sessions, you must submit a one-page paper reflecting on the discussion. This should not simply be a regurgitation of the content, but rather a *substantive* personal contemplation of the experience. These papers are due within one week of the session. |

## Course Policies

**Collaboration**
You are permitted to ***discuss*** assignments with other students in the class. Under no circumstances should there ever be an electronic transfer of code between students in the class.

**Academic Integrity**
Honesty and integrity are qualities we respect in ourselves and in others. Therefore, you are expected to be fully aware of your responsibility to maintain the highest degree of integrity in all of your work. It is accepted that you have read and understood the standards for academic integrity at Roanoke College.

In the electronic age, source code is often available on the web or through CD-ROMs that supplement textbooks. If you use code from any other source, you are required to cite the source by adding comments to the top of your files. Moreover, by submitting work under your name, you are indicating that you have completed the assignment. This means that you should be able to completely explain all the details of your work, i.e. every line of code in computer programs or formulas in spreadsheets. Failure to be able to account for your decisions (to my satisfaction) will result in referral to the Academic Integrity Council.

All students must abide by the Guidelines for Computer Use as stated on page 15 of the Academic Integrity Handbook. Failure to do so will result in involuntary withdrawal from the course

**Late Assignments**
I understand that circumstances conspire against us all, and when 3 term papers and a programming assignment are due within a 24-hour span, something has to give. If you need to hand in an assignment late, you must contact me via e-mail 24 hours in advance of the due date

to negotiate a new submission date.  Any late submission without prior approval will be penalized 10% per day.