McGill University, Fall 2012

Class times 1:05 PM - 2:25 PM Mondays and Wednesdays
Lecture room Trottier Building 0060
Instructor Paul Kry, kry@cs.mcgill.ca
Office McConnell Engineering Building (ENGMC) 113N
Office hours 4:30 PM - 5:30 PM Wednesdays, or by appointment

Teaching Assistants Sheldon Andrews, sheldon.andrews@mail.mcgill.ca
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Office and hours TBA (see course web page), or by appointment

Course Description from McGill Calendar

Note that this official course description is slightly outdated. For the topics covered this semester, see “Topics” on the following page.

The study of fundamental mathematical, algorithmic and representational issues in computer graphics. The topics to be covered are: overview of graphics process, projective geometry, homogeneous coordinates, projective transformations, quadrics and tensors, line-drawing, surface modeling and object modeling reflectance models and rendering, texture mapping, polyhedral representations, procedural modeling, and animation.

Lecture Notes

All material covered in the lectures which is not already in the course textbook will be made available on-line on the course web page.

Reference Textbooks

The course textbook Fundamentals of Computer Graphics, 3rd edition, by Peter Shirley and Steve Marschner. Course material will largely follow this book, except for special topics, or when noted in class. Both second and third editions of this book are on reserve at the Schulich library should you wish to compare versions.
The following references (some available online, see below) are recommended for the assignments.

- The OpenGL Programming Guide - The Redbook. (T385 O635 2006)

This book will be on reserve at the Schulich library for two hour loan. The latest version is not necessary for this course, and earlier versions are available online at a variety of locations, including http://www.opengl.org/documentation/red_book/.

The following book is also an excellent reference for the assignments. It is inexpensive, and is also on reserve at the Schulich library.


Other excellent books related to the course material are also on reserve at the Schulich library:


**Topics covered in Fall 2012**

**Geometry**

- rotations, scaling, translations
- homogeneous coordinates, viewing transformations
- projections
- normalized view coordinates, clipping, viewports
- texture mapping
- visible surface algorithms (hidden surface removal, ray casting)
- cubic curves and surfaces
- meshes
- mesh simplification
- subdivision surfaces
- L-systems

**Rendering**

- drawing a line, sampling, aliasing
- illumination and reflectance
• shading models for polygons (Gouraud and Phong)
• bump mapping, environment mapping
• transparency and volume rendering
• shadows
• noise
• depth of field
• global illumination

Image capture and display

• inpainting
• color
• gamma correction
• high dynamic range imaging

Some advanced topics may be omitted, while a selection of other advanced topics may also be covered if time permits. A tentative schedule can be found on the course web page, and a full schedule with notes on each lecture will be recorded in a MyCourses forum.

Prerequisites

There are three official prerequisites for the course:

• COMP 206 Introduction to Software Systems

  Historically, the assignments have required programming in C and the use the unix utility make (the assignments are now in Java). Nevertheless, the prerequisite still has some relevance because for the use of libraries, and debugging and testing of code.

• MATH 223 Linear Algebra

  This course will build upon your basic understanding of vectors and matrices. You should have at least a B grade in your linear algebra course, or be prepared for a serious review.

• COMP 251 Data Structures and Algorithms

  This prerequisite is mostly there to ensure you have a sufficiently high level of mathematical maturity. A high grade in COMP 250 is probably sufficient though.

Although it is not a prerequisite, it is strongly recommended that you have taken MATH 222 (Calculus 3) which is required for CS Majors, or the equivalent. In particular, you need to know what a parametric representation of a smooth surface is, and what a partial derivative is.
Evaluation

There will be two exams, worth a total of 60% of the final grade. The first will be a midterm exam which will take place in class, no earlier than the 13th October and no later than the 25th of October. It is worth 20% of your grade. The second exam will take place during the Final Exam Period and is worth 40% of the final grade.

There will be four assignments, worth a total of 40% of your final grade. Each will involve some short written exercises and some graphics programming in OpenGL, which is a standard applications programmer interface (API). The good way to begin learning OpenGL is to read the first three chapters of The Red Book, or read Angel’s book, “OpenGL: a primer”. Programming assignments must be done using Java, and must be submitted electronically via WebCT. Late assignments will be accepted up to two days after the deadline and will receive a penalty of 10%.

Students with grades of D, F or J will not be given the opportunity to complete additional work to upgrade their grade. However, there will be a Supplemental Exam\(^1\). It will cover the same material as the Final Exam, is worth (i.e., replaces) the 40% component of that exam. For information on Supplemental Exams, see


In case you didn’t already know...

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures. See www.mcgill.ca/integrity for more information, as well as www.mcgill.ca/integrity/studentguide, the Student Guide to Avoid Plagiarism.

It should be noted that, in accordance with article 15 of the Charter of Students’ Rights, students may submit examination answers in either French or English.

According to Senate regulations, instructors are not permitted to make special arrangements for final exams. Please consult the Calendar, section 4.7.2.1, General University Information and Regulations at www.mcgill.ca. Special arrangements in emergencies may be requested at your Student Affairs Office. If you have a disability, please advise the Office for Students with Disabilities (398-6009) as early in the term as possible so that we can provide appropriate accommodation to support your success.

In the event of circumstances beyond the instructor’s control, the evaluation scheme as set out in this document might require change. In such a case, every effort will be made

\(^{1}\)McGill requires that any course with an exam during the Final Exam Period must have a Supplemental Exam.
to obtain consensus agreement from the class.

Additional policies governing academic issues which affect students can be found in the Handbook on Student Rights and Responsibilities, Charter of Students’ Rights